A GEOGRAPHY OF AMERICA

BY

T. ALFORD SMITH, B.A.(Lond.), F.R.G.S.

SENIOR GEOGRAPHY MASTER, ST. DUNSTAN'S COLLEGE, CATFORD

MACMILLAN AND CO., LIMITED
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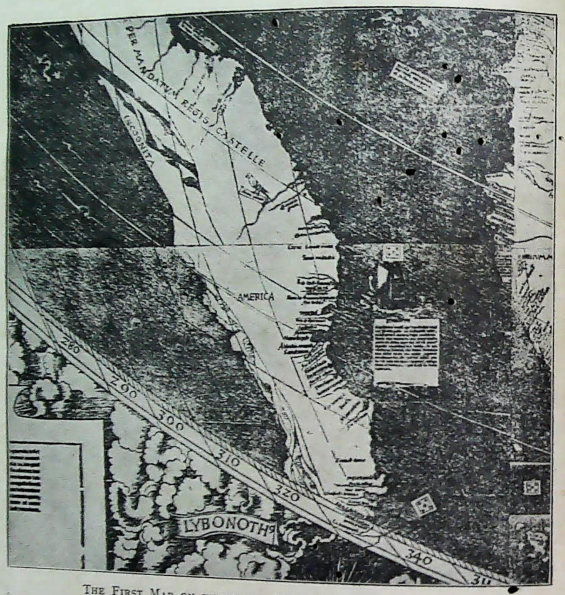
1919



THE FIRST MAP ON WHICH THE WORD "AMERICA" OCCURS.
Taken from Waldseemuller's map of the World, published 1507 (see page 8).

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PREFACE

THE lessons have been arranged to emphasize the special features of the regions selected, to explain the conditions under which men live in those regions, and to show the relation of these conditions to human activity. The lessons consist of (*a*) practical exercises based chiefly on map reading and statistical exercises, (*b*) a short description of the region, (*c*) questions which require descriptive answers.

The maps in the book are intended to illustrate particular points in the lessons; many names in the text do not appear on the maps. A good atlas should, therefore, be used in connection with the various lessons.

It is assumed that the pupil has already an elementary knowledge of Physical Geography and that he has had some training in the use of maps.

The statistical tables have been prepared from the Annual Statements issued by the Board of Trade, the various Consular Reports, the *Statesman's Year Book*, the official publications issued by the Governments of Canada, the United States, Brazil, Argentina and other works of reference.

Unless otherwise stated, all the statistics given are average values, average quantities, etc.; in all the trade statistics the averages are for a period of years immediately preceding the outbreak of the war in 1914.

Grateful acknowledgments must be made to those who have kindly allowed pictures and photographs to be reproduced as illustrations.

Thanks are also due to Mr. J. F. Usherwood and Mr. J. Martin for reading the proofs, and to Prof. R. A. Gregory and Mr. A. T. Simmons for many valuable suggestions in the preparation of the work.

T. ALFORD SMITH.

ST. DUNSTAN'S COLLEGE,
1918.

CONTENTS

LESSON I.

INTRODUCTION.

Discovery of America.—More than a thousand years ago bold **Norsemen** sailed the North Atlantic, and in the course of their voyages discovered the Faroes, Iceland and Greenland; according to their legends these sea-rovers sailed beyond Greenland to Vinland and Markland, places situated without doubt on the continent of North America. These early navigators did not establish permanent settlements in North America; it was very difficult for them to keep up communication between Scandinavia and America because of the ice-floes which are encountered near Greenland and Labrador. In course of time the knowledge of their discoveries was almost forgotten.

Columbus.—In 1492 Christopher Columbus, a native of Genoa, re-discovered America. Filled with a desire to find a westerly route to India, he obtained the assistance of Ferdinand and Isabella of Spain, and sailed with a fleet of Spanish ships from Saltes. Columbus first sailed to the Canary Islands (lat. 28° N.), which lie in the belt of the North-east Trade winds, and helped by these winds he succeeded in reaching **San Salvador**, now called Watling Island (in the Bahamas), and in sighting Hayti and Cuba. Through an inaccurate calculation of longitude, Columbus thought he had found a route to India, and so he gave the name Indies to the islands he had discovered; and the word Indian was afterwards applied to the natives both of the islands and of the mainland. In his subsequent voyages Columbus discovered the northern coast of South America (1498) and the

southern shores of the Gulf of Mexico (1502-4). The name Columbus appears on the map in Colombia, British Columbia, Colon, etc., but the name America was derived from that of a man who little deserved such distinction.

Amerigo Vespucci, a Florentine by birth, was a provision contractor at Cadiz about the time of Columbus's first expedition. After the return of Columbus with the news of his great discovery, many expeditions were fitted out in Spanish ports to visit the New World. Although he was not a practical navigator, Amerigo Vespucci joined an expedition which explored the coast of Venezuela in 1499. Some years later an account was published in which it was inaccurately stated that Vespucci had reached the mainland in 1497, and that he had made extensive discoveries along the coasts of the continent. These statements were unsupported except by Vespucci's own assertions, but at the time they were believed to be true. In 1507 Waldseemuller published a map at St. Dié (Vosges district) on which the name America occurs for the first time.

Vespucci seems to have realised that the newly-discovered land was a continent of considerable size and not, as Columbus thought, a part of Asia or a group of islands off S.E. Asia.

Treaty of Tordesillas.—In consequence of the discoveries of Columbus to the west and Vasco da Gama's discovery of the sea route to India (1487), Spain and Portugal came to an agreement in 1494, and by the Treaty of Tordesillas it was decided that lands west of longitude 45½° W. should belong to Spain, and lands east of that meridian should belong to Portugal. This arrangement received the sanction of the Pope, but other sovereigns did not consider it binding upon them, for France afterwards took possession of the St. Lawrence valley, and England attempted to colonise Virginia.

Cabral.—In 1500 a Portuguese navigator named Cabral set sail from Lisbon on a voyage to India; to avoid being becalmed off the coast of Africa (near Sierra Leone), he steered

so far to the west that his ships were carried by the ocean currents to the unknown coast of Brazil (from C. Palmas to C. San Roque is 1700 miles); as this coast was east of meridian 45½° W. Cabral claimed the country as Portuguese territory.

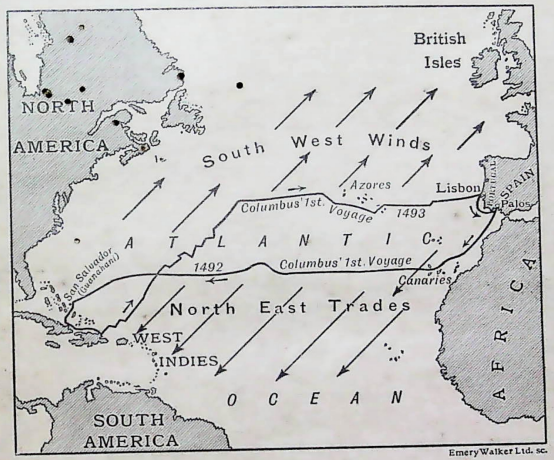


FIG. 1.—ROUTE TAKEN BY COLUMBUS ON HIS FIRST VOYAGE TO THE NEW WORLD, 1492.

Cabot.—England as well as Spain and Portugal took part in the discovery of the New World, for in 1497 Henry VII. granted letters patent to John Cabot, a Genoese pilot who had settled in Bristol. Cabot, accompanied by his three sons, sailed to the west and sighted **Cape Breton Island, Nova Scotia, Newfoundland** and **Labrador**. Although the French afterwards settled in the St. Lawrence valley, in Nova Scotia (Acadia) and Cape Breton Island, the French fishermen always acknowledged Great Britain's right to Newfoundland

because of Cabot's discovery (see p. 33). John Cabot's son Sebastian, later explored part of the Atlantic coast of South America as far as the Plate River.

Cartier.—Jacques Cartier, a Breton sea captain, made three voyages to North America between the years 1534-41. He gave the name to the **St. Lawrence**, and ascended the river probably as far as the island on which Montreal stands. The object of his expeditions was not to make settlements but to trade (especially in furs). In consequence of Cartier's voyages, the French claimed the St. Lawrence valley.

Cortes.—In the opening years of the sixteenth century Spanish adventurers were active in exploring the shores of Central America and Mexico. The most important expedition was fitted out under the leadership of Hernando Cortes in 1518. Starting from Cuba, he sailed along the coast of Yucatan and entered the Gulf of Mexico, the shores of which he explored as far north as **Vera Cruz** (a town named by Cortes in honour of the True Cross). After climbing the cordilleras and crossing the plateaux, Cortes reached the capital and overthrew the power of the **Aztecs**, and brought **Mexico** under Spanish rule. After the subjugation of the country, the Spaniards explored the Pacific coast of Mexico as far as the Gulf of California.

Pizarro.—Inspired by the example of Cortes, Francisco Pizarro prepared an expedition for the **conquest of Peru** in 1531. Pizarro had already served under Nuñez de Balboa, who first saw the Pacific from a ridge in the isthmus of Darien (1513). Pizarro made his preparations at the town of Panama, and then sailed southwards along the west side of the continent. Landing on the coast of Peru he climbed the lofty passes of the Andes and overthrew the empire of the **Incas**. He then founded a new capital, **Lima**, at no great distance from the sea, a more convenient position for the Spaniards than Cuzco, situated on the plateau. Pizarro sent his lieutenant Almagro to subdue Chile. In 1539 **Gonzalo**, the governor of Quito and brother of the conqueror of Peru, led an expedition to the eastern slopes of the Andes,

and followed the course of the River Napo for some distance towards the **Amazon**. His lieutenant **Orellana** deserted him and proceeded to sail down the Amazon to the sea (see p. 271).

Magellan.—Magellan was Portuguese by birth; after serving under the Portuguese flag in the East Indies and in Morocco, he offered his services to Charles V. of Spain. He set out in 1519 to find a westerly route to the Moluccas. Having passed along the coast of Patagonia, he entered the strait which bears his name, but encountered great difficulty in passing through it because of the westerly winds which prevail in those latitudes. After the stormy passage of the strait he reached the open ocean, to which he gave the name Pacific (peaceful); he crossed this ocean to the East Indies, but lost his life in the Philippines. His companions, however, brought his ship safely round South Africa to Spain, and thus completed the first voyage round the world, 1522.

Drake.—In order to attack Spanish ships and Spanish settlements, Francis Drake set out in 1578 on his voyage round the world. Coasting the east side of South America, he reached the Strait of Magellan and found great difficulty in passing through the strait; he also met with stormy weather in the Pacific. With only one ship left out of seven, Drake proceeded northwards along South America, plundering many Spanish towns and capturing the cargoes of many Spanish ships. He continued his voyage along the coast of North America, past the Golden Gate; he then landed, set up the British flag and proclaimed the country under the title of **New Albion** as a possession of Queen Elizabeth. Drake then crossed the Pacific to Java and sailed round South Africa to England, 1580.

North-West Passage.—By the end of the sixteenth century Europeans had gained some knowledge of the Atlantic and the Pacific coasts of America, but little was known of the Arctic coast. Many attempts had been made to discover a route to India by the North-West Passage. **Frobisher** made the first attempt in 1576, and a few years later Davis

sailed up the strait which bears his name. He was followed by **Hudson** (an Englishman in the service of the Dutch East India Company), who succeeded in passing through, Hudson Strait and entering the great bay called after him. Hudson thought he had reached the Pacific. Five years later **Baffin** found the northern outlet to Baffin Bay, but after this, little was done for more than a century.

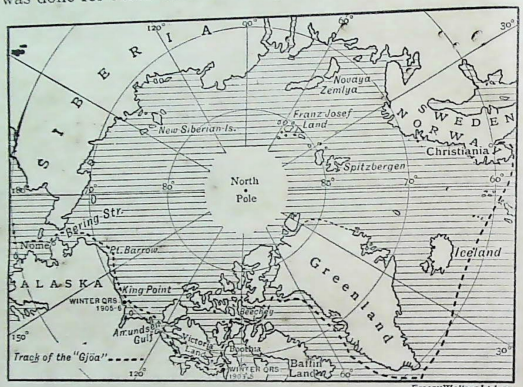


FIG. 2.—THE NORTH-WEST PASSAGE.
The broken line shows the route taken by Amundsen's ship *Gjöa*.

Bering Strait was discovered in 1648 by a Cossack named **Deschnev**, who started from the north coast of Siberia and passed through the strait into the Pacific. Europeans did not credit the existence of this strait until 1728, when a Russian expedition under Bering (a Dane) proved that it was true.

During the nineteenth century many expeditions were sent out to explore the northern coast of America and the channels between the islands. The most memorable of them all was that of **Sir John Franklin** (1845-7), in which the whole party perished; many search parties went out to ascertain the

fate of the expedition, and these search parties gained much information of the northern regions. One of them under **McClure** (1850) went out by way of the Pacific to Bering Strait, and then turned eastward along the American coast. McClure lost his ship, but he and his party were rescued and brought home by way of Davis Strait. McClure had therefore actually traversed the **North-West Passage** from ocean to ocean. Later search parties found relics of Franklin's expedition, and among them were records which proved that Franklin had really accomplished the North-West Passage, and that it was in returning that disaster fell upon him.

The exploit of sailing through the North-West Passage and of returning safely with his ship belong, however, to **Roald Amundsen** (1903-6), who is still more famous for his journey to the South Pole. The route of Amundsen's ship (the *Gjöa*) is shown in Fig. 2; it will be noticed that he sailed from the Atlantic to Bering Strait and so to the Pacific. In the course of his expedition he relocated the North Magnetic Pole in Boothia Felix (already discovered by Ross).

EXERCISES.

1. With regard to the New World, why was the part played by Christopher Columbus of far more importance than that of Amerigo Vespucci?

2. Say what you know of the first European expeditions to (*a*) Mexico, (*b*) Peru, (*c*) St. Lawrence valley respectively.

3. What Englishmen made discoveries on the coast of America? Of what importance were these discoveries?

4. In what circumstances did Brazil become a Portuguese possession in the sixteenth century?

5. Write notes on the discoveries of: Cabot, Orellana, Hudson, Bering.

6. What expedition first circumnavigated the world? Write a brief account of the route.

7. What is meant by the North-West Passage? Why were so many attempts made to traverse this passage? Who took part in these attempts and with what success?

8. Write, in chronological order, a list of the discoveries mentioned in this lesson.

9. Examine the map on the front page, and describe its chief features.

In 1507 Waldseemuller published a book called the *Cosmographiae Introductio*, in which it was first suggested that the New World should be called America; at the same time he produced a large map of the world to illustrate the book. A small part of this map is reproduced as a frontispiece. It represents South America as Waldseemuller imagined it, and immediately over the Tropic of Capricorn he inserted the name America. The word Lybonoth or Libonotos means the Lybian south wind; such a wind would probably be described to-day as S.S.W.

PART I.

DOMINION OF CANADA.

LESSON II.

CANADA: EXTENT, POPULATION, RESOURCES.

1. From the accompanying table find (1) the land area of Canada, (2) the population of Canada. Which province of Canada is most densely populated? Which most thinly populated? What is the population per sq. mile for that part of Canada which lies between the international boundary line and latitude 60° N.?

DENSITY OF POPULATION.

Province.	Land Area in 1000 sq. miles.	Census 1911. 1000.	Population per sq mile.
Prince Edward Island,	2	94	43
Nova Scotia,	21	492	23
New Brunswick,	28	352	13
Quebec,	691	2,003	6
Ontario,	366	2,523	10
Manitoba,	232	456	6
Saskatchewan,	243	492	2
Alberta,	253	375	1·5
British Columbia,	353	392	1
Yukon	206	9	—
North-West Territories,	1,208	18	—

2. According to the census of the prairie provinces in 1916 the number of people should be: Manitoba 554,

Saskatchewan 648, and Alberta 497. From these numbers, find the population per square mile of each prairie province.

3. Immigration into Canada takes place chiefly from the United Kingdom (*via* the St. Lawrence estuary) and from the United States of America. From the subjoined table draw graphs (see Fig. 6) to represent the immigration statistics for the period 1908-14.

(In each column the number of thousands of immigrants is given.)

IMMIGRATION INTO CANADA.

Year.	United Kingdom.	United States.	China, Japan, India.	Other Countries.
1908	120	58	10	74
1909	53	60	2	32
1910	60	104	2	43
1911	123	121	6	61
1912	138	134	7	75
1913	151	139	8	105
1914	143	108	7	128

Under the diagram state (*a*) the ports at which the immigrants from the United Kingdom chiefly land, (*b*) the districts to which they go after landing.

Canada.—The name Canada is a word of Indian origin, and it was applied by the French explorers of the sixteenth century to the lands along the St. Lawrence estuary. After the cession of Canada by the Treaty of Paris in 1763 this area was brought under British rule (Fig. 3). Settlers from Great Britain and from the New England States soon afterwards settled along the northern shores of the Great Lakes, and this territory became known as **Upper Canada** to distinguish it from **Lower Canada.** The Government of these provinces underwent many changes until 1867, when a confederation was made to include Ontario, Quebec, New Brunswick and Nova Scotia (Fig. 4); but provision was made to add other territories to the confederation as opportunity might offer. This was the beginning of what is now called the **Dominion of Canada.**

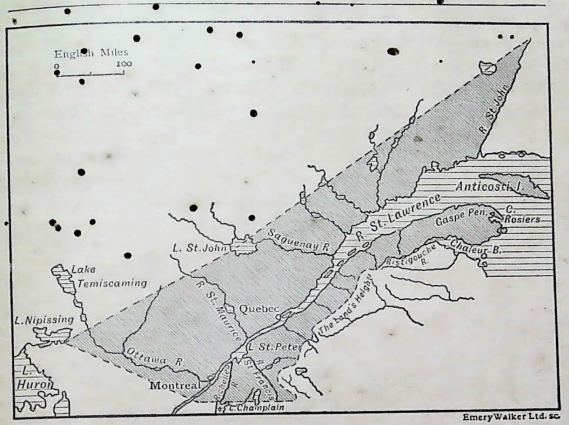


FIG 3.—CANADA IN 1759.
The names Temiscaming and Ristigouche are now spelt Timiskaming and Restigouche respectively
(By permission of the Delegates of the Clarendon Press.)

FIG. 4.—THE DOMINION OF CANADA, 1867.
The extent of the Dominion is shown with dark shading.
(Prince Edward Island entered into confederation in 1873.)

Expansion of Canada.—In 1870 the province of **Manitoba** was formed out of lands formerly held by the Hudson Bay Company, and in the following year British Columbia joined the confederation on condition that a railway should be constructed to connect it with the Eastern provinces. The completion of the Canadian Pacific Railway in 1885 led to the rapid development of the lands along the route, and these lands were divided into the two provinces **Saskatchewan** and **Alberta** in 1905. The discovery of gold in the **Yukon** valley resulted in the formation of a territory in the far north.

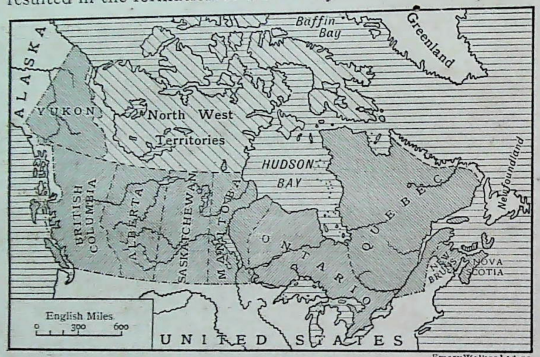


FIG. 5.—THE DOMINION OF CANADA, 1912.

It will therefore be seen that the name Canada is no longer restricted to the St. Lawrence valley, but it is now applied to a vast territory which stretches from the Atlantic to the Pacific and northwards to the Arctic regions.

The international boundary between the Dominion of Canada and the United States of America runs eastward from the Pacific coast along latitude 49° N. until within a short distance of Lake Superior; it passes through Lakes Superior, Huron, Erie and Ontario, and then proceeds south of the St. Lawrence to the Bay of Fundy. From this international boundary line, Canada extends northwards to the Arctic

seaboard (and to the islands near it), and it also stretches to the Alaskan boundary in the north-west, long. 141° W.

The two **outstanding features** of Canada are (1) its vast size, and (2) its small population. The area of Canada is a little greater than that of the United States, but the total population (census 1911) was only about seven millions—the population of the United States being ninety-three millions.

Density of Population.—It will be seen from the table (p. 9) that Prince Edward Island and Nova Scotia are the most densely populated provinces of Canada; these provinces are, however, small in size, and they have long been settled. Most of the people of Canada live in a narrow strip along the southern frontier; north of this strip are extensive areas which are almost uninhabited. Large cities have grown up (*a*) in the St. Lawrence valley, by which route Canada can be most easily approached from Europe; such cities are **Quebec, Montreal**; (*b*) on the shores of the Great Lakes, *e.g.* **Toronto, Hamilton**; (*c*) along the routes of the great railways, *e.g.* **Winnipeg, Calgary, Regina, Edmonton**; and (4) on the coast lines, *e.g.* **Vancouver** and **Halifax.**

Immigration.—Large numbers of immigrants enter Canada every year from the United Kingdom, the United States and Central Europe. This immigration is mainly due to the opening up of the rich agricultural lands in the western provinces and to the improved means of communication (p. 10). The emigrants from European countries land at the ports on the St. Lawrence estuary, as well as at **Halifax** and at **St. John.** Some oriental immigrants (Chinese, Japanese and Hindoos) enter British Columbia through the port of Vancouver on the Pacific coast; owing to the heavy influx of orientals into Canada, serious restrictions have been imposed on these emigrants from time to time.

Natural Resources.—Owing to its great natural resources Canada will be able in the future to support many times more people than it does at present. These resources are: rich arable lands, extensive forests, inexhaustible fisheries, valuable minerals, and so on.

Canada produces enormous quantities of **food**; on the agricultural lands wheat and other cereals are grown largely for export; root-crops and fruits are grown in many districts. Cheese and butter are made in large quantities in the factories of the farming districts.

Fish abound in nearly all the rivers and lakes as well as in the waters near the Atlantic and Pacific coasts.

Forests.—Lumbering is one of the oldest industries, and it is still of great value to the people of New Brunswick, Quebec, Ontario and British Columbia. Spruce is the most important wood for the production of lumber and pulp. Maple is used for furniture, agricultural implements, cars, etc. Cedar is largely used for poles, fence posts, railway sleepers, etc.

Minerals.—Ontario, British Columbia and Nova Scotia are the three chief mineral-producing provinces. The mineral wealth of many districts is practically untouched. It should be noticed that coal is obtained in Nova Scotia near the Atlantic coast, in British Columbia near the Pacific coast, and also in the province of Alberta.

Trade.—The trade of Canada is carried on chiefly with the United States and with the United Kingdom. In 1914 the value of the goods imported into Canada from the United States (p. 17) was about three times that of the goods from the United Kingdom. This is partly accounted for by the fact that goods manufactured in the United States can be sent across the frontier into Canada, while from England goods must cross the Atlantic. The value of the goods exported from Canada to the United Kingdom exceeds, however, that of the goods sent to the United States. This is partly due to the fact that Canada and the United States produce many articles of the same kind, such as wheat, oats, barley, etc.; hence in these articles there will be little interchange. The United Kingdom, on the other hand, is greatly in need of the articles which Canada produces; it will be seen from the table of Imports and Exports (p. 18) that Canada sends to this country enormous quantities of cereals

(value £10 million per annum), dairy produce, wood and timber, and many other articles. In return for these goods Canada receives from the United Kingdom large quantities of textiles (especially woollen, cotton, and linen goods), iron and steel goods, machinery and other manufactured articles. From Canada to the United States, lumber, metals, coal, fish and furs are the chief articles sent in return for manufactured goods.

EXERCISES.

1. What is meant by "the Dominion of Canada"? Trace the steps by which the Dominion has been formed.

2. Which are the most densely populated parts of Canada? Give reasons for the distribution of population.

3. What minerals are obtained in large quantities in Canada? Describe the importance of the mineral productions. (See p. 18.)

4. Write an account of the trade of Canada. Give examples of imports and exports, and point out the importance of each example. (See p. 18.)

5. Write notes on (*a*) Canadian immigration, (*b*) the international boundary line.

6. The cities in the subjoined table are the only cities in the Dominion which have more than 20,000 inhabitants according to the census 1911.

CHIEF CITIES IN CANADA.

Cities.	Population 1000	Cities.	Population 1000.
Montreal,	470	London,	46
Toronto,	377	Calgary,	44
Winnipeg,	136	St. John,	43
Vancouver,	100	Victoria,	32
Ottawa,	87	Regina,	30
Hamilton,	82	Edmonton,	25
Quebec,	79	Brantford,	23
Halifax,	47		

For the census returns 1916, the numbers for the following should be: Winnipeg 163, Calgary 56, Regina 26, Edmonton, 54.

State the position of each of the above cities as regards latitude, longitude, and province.

7. Examine the values of (1) the imports, (2) the exports, for the period 1905-14 in the subjoined tables (p. 17) with reference to the graphs which represent these values (Fig. 6). Find the total value of the imports of Canada for each of the years 1905 to 1914, and draw a graph to represent the values. Find also the total value of the exports and draw a graph.

8. Draw graphs (similar to those in Fig. 6) for the imports and exports of Canada for the period 1911-17. Under each diagram write notes (*a*) on the period 1911-13 and (*b*) on the period 1915-17.

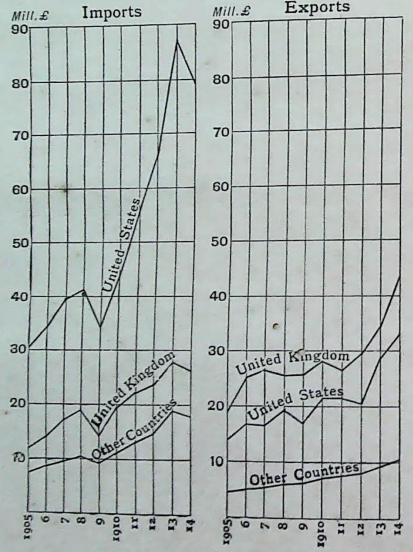


FIG. 6.—DIAGRAM TO REPRESENT THE TRADE OF CANADA WITH THE UNITED STATES, UNITED KINGDOM AND OTHER COUNTRIES.

IMPORTS OF CANADA.

	United Kingdom.	United States.	Other Countries.
	£1000	£1000	£1000
1905, - -	12,068	30,486	7,769
1906, - -	13,837	33,760	9,060
1907, - -	17,175	39,626	9,793
1908, -	18,883	40,930	10,563
1909, - -	14,136	34,011	9,496
1910, - -	19,067	43,500	11,395
1911, - -	21,987	54,969	13,393
1912, - -	23,381	66,086	14,823
1913, - -	27,748	87,154	19,115
1914, - -	26,388	79,113	18,164
1915, - -	18,032	59,326	13,731
1916, -	15,481	74,099	11,983
1917 - -	21,414	132,843	14,808

EXPORTS OF CANADA.

	United Kingdom.	United States	Other Countries.
	£1000	£1000	£1000
1905, - -	19,423	14,085	4,663
1906, - -	25,491	16,709	4,896
1907, - -	26,318	16,602	5,226
1908, - -	25,239	19,163	5,990
1909, - -	25,277	17,067	6,177
1910, - -	27,896	20,840	7,113
1911, - -	26,431	20,823	7,609
1912, - -	29,448	20,408	8,188
1913, - -	34,032	27,945	9,173
1914, - -	43,051	32,674	10,592
1915, - -	37,334	34,664	9,886
1916, - -	90,370	40,221	17,730
1917, - -	148,429	56,123	25,722

9. In the subjoined tables the value is given of the chief imports and exports of Canada. Rewrite the list of articles imported into Canada in order of value; write notes on the

first six articles on the list. In the same way rewrite the exports and write notes on the first six articles.

IMPORTS AND EXPORTS OF CANADA.

Articles Imported into Canada from the United Kingdom.	Value £1000	Articles Exported from Canada to the United Kingdom.	Value £1000
Apparel,	661	Wheat,	7,631
Spirits, British and Irish,	580	Barley,	235
Books, Printed,	213	Oats,	464
Chemicals,	380	Wheatmeal and Flour,	1,800
China and Earthenware,	399	Fish, of all kinds,	1,017
Cotton Goods,	2,721	Apples, raw,	799
Glass Manufactures,	311	Bacon and Hams,	1,541
Hats of all sorts,	389	Cheese,	4,384
Machinery,	732	Pulp of Wood,	157
Iron and Steel Goods,	2,566	Wood and Timber,	3,517
Woollen Yarn,	409	Skins and Furs,	192
Woollen Goods,	3,645	Leather,	330
Linen Goods,	639	Asbestos, raw,	45
Total Imports,	21,000	Total Exports,	26,000

10. On an outline map of Canada mark the names of the provinces, together with the names of the minerals given in the subjoined table. Also enter the names of any important mining centres such as Sudbury in Ontario.

MINERAL PRODUCTION OF CANADA.

Province.	Gold.	Silver.	Copper.	Lead.	Coal.	Pig Iron.
	£1000	£1000	£1000	£1000	1000 tons	1000 tons
Ontario,	218	3,011	543	—	—	482
Quebec,	1	2	60	—	—	2·5
British Columbia,	1,093	288	1,438	297	2,789	—
Nova Scotia,	31	—	—	—	6,916	391
New Brunswick,	—	—	—	—	56	—
Saskatchewan,	—	—	—	—	194	—
Alberta,	·2	—	—	—	2,578	—
Yukon,	942	9	—	—	7	—

In addition to the above there are produced: nickel (chiefly in Ontario), value £2,249,000; zinc ore, £36,000; asbestos, £576,000.

LESSON III.

CANADA: RELIEF AND CLIMATE.

1. On an outline map of Canada (showing rivers) enclose with dotted lines the drainage basins in the subjoined table. In each basin enter the names of the chief rivers and lakes.

Drainage Basin.	Area 1000 sq. mls.	Drainage Basin.	Area 1000 sq. mls.
Atlantic,	554	Arctic,	1,290
Hudson Bay,	1,486	Bering Sea,	146
Pacific,	242	Gulf of Mexico,	12

2. From a contour map of Canada draw a section along latitude 50° N.

3. Examine (1) the subjoined tables with regard to Victoria and Winnipeg; (2) the diagrams (p. 25) which represent the temperature and precipitation at these places.

Month.	Victoria, B.C., 48½° N.				Winnipeg, 50° N.			
	Mean Temp.	Rain.	Snow.	Total Precipitation.	Mean. Temp.	Rain.	Snow.	Total Precipitation.
	F.	in.	in.	in.	F.	in.	in.	in.
Jan.	39·2	3·88	6·3	4·51	−4·7	0·00	8·2	0·82
Feb.	40·3	3·08	4·5	3·53	−1·0	0·03	8·7	0·90
March	43·1	2·40	1·5	2·55	13·9	0·25	9·0	1·15
April	47·7	1·73	—	1·73	37·1	1·10	3·8	1·48
May	53·0	1·30	—	1·30	52·0	2·22	1·3	2·35
June	57·1	0·93	—	0·93	62·0	3·58	14·1	3·58
July	60·3	0·36	—	0·36	65·9	3·15	—	3·15
August	60·0	0·65	—	0·65	63·2	2·45	—	2·45
Sept.	55·6	2·01	—	2·01	53·1	2·07	—	2·07
Oct.	50·4	2·55	—	2·55	40·0	1·48	2·5	1·73
Nov.	44·5	6·31	1·5	6·46	19·6	0·10	10·0	1·10
Dec.	41·5	5·86	0·5	5·91	4·7	0·08	8·3	0·91
Year	49·4	31·06	14·3	32·49	38·8	16·51	51·8	21·69

NOTE.—Under the term precipitation is included all forms of moisture, such as rain, snow, hail and sleet. It has been found that

Compare the climatic conditions at Victoria with those at Winnipeg.

Draw similar diagrams to represent the temperature and precipitation at Toronto, Montreal, Edmonton, Prince Albert, respectively (pp. 302-3).

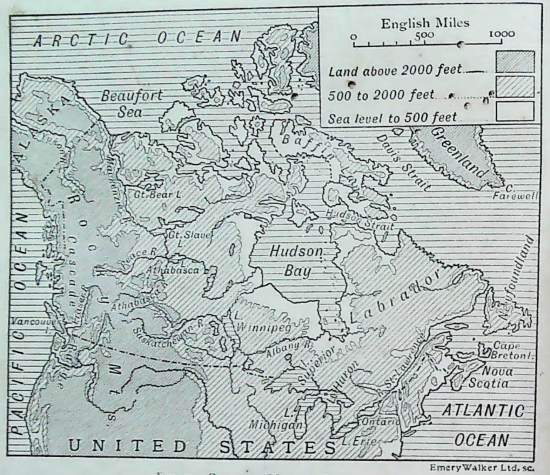


FIG. 7.—CONTOUR MAP OF CANADA.

Relief.—From the contour map of Canada (Fig. 7) it will be noticed that most of the land below 500 feet is in the St. Lawrence valley, around Hudson Bay, and along the coast of the Arctic Ocean. Between the St. Lawrence valley and Hudson Bay is the Laurentian Plateau across which runs the divide separating the north bank tributaries of the

a given fall of snow will in melting diminish to about one-tenth of its original depth; hence in the above table the number of inches of snow is divided by ten and then added to the number of inches of rain.

St. Lawrence from the streams which flow into Hudson Bay. West of longitude 100° (see Atlas) the land rises gradually to the Rocky Mountains, a great range which runs in a north-westerly direction.

From the Rocky Mountains the North Saskatchewan and

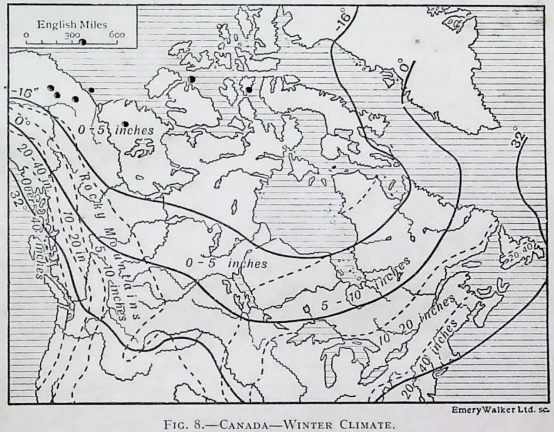


FIG. 8.—CANADA—WINTER CLIMATE.
The isotherms for January. The Rainfall November-April.

South Saskatchewan flow eastwards to Lake Winnipeg, the surplus waters being carried by the Nelson River into Hudson Bay, while the rivers Athabaska and Peace drain into the Great Slave Lake from which the Mackenzie flows to the Arctic Ocean.

The countless lakes dotted over the plains east of the Rocky Mountains lie in rock basins hollowed out by the ice sheet which once covered the whole of this region; rock waste left by the glaciers spreads over northern Ontario and the lands round Hudson Bay; and boulder clay, also a result of glaciation, partly forms the soil of the prairie provinces.

West of the Rocky Mountains short, swift rivers, such as the Fraser and Columbia, flow in deep valleys and cut their way through the coast ranges to the Pacific.

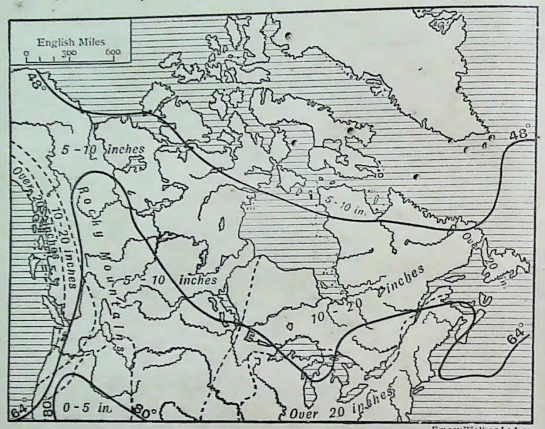


FIG. 9.—CANADA—SUMMER CLIMATE.
The isotherms are for July. The rainfall May-October.

Climate.—That part of Canada which stretches from the international boundary line to latitude 60° N. is situated in the North Temperate Zone; westerly winds prevail in this belt, and on the Pacific seaboard they blow more strongly than in any other part of Canada. As the westerly winds reach the great mountain ranges of Western Canada, the warm moist air is deflected upwards; it cools rapidly, rain falls and heat is liberated. Having crossed the range the heated air current descends and becomes further warmed by compression; it therefore reaches the plains as a dry, warm wind which melts the snow in winter, and in summer scorches the vegetation. The Indian word *Chinook** is applied to such

* The Chinook Indians used to live in the valleys of the Canadian Rockies.

winds; and they blow most frequently in Southern Alberta and in Saskatchewan.

East of longitude 100° the temperature of the air over the land in summer is much higher than that over the sea; hence

FIG. 10.—THE NATURAL REGIONS OF CANADA.

the direction of the wind depends very largely on the circulation of the atmosphere round the low-pressure areas over the land. During this period of the year the winds often blow from the sea towards the land, and hence most rain falls in the summer months.

With regard to temperature, it should be noted that as a rule the winter temperature falls with distance from the equator; other factors, however, must also be taken into account, such as (*a*) distance from the sea, (*b*) elevation above sea-level.

Natural Regions.—Canada may be divided broadly into the five natural regions shown in Fig. 10.

(1) **Eastern Margin.**—In the eastern margin, the climate is of the Quebec type. The special features of this region are: cold winters, heavy snowfall, and moderate rainfall. The rivers and harbours are ice-bound in winter, except Halifax harbour, the Bay of Fundy, and other places on the south-east coast.

The cold **Labrador current**, bringing icebergs from Baffin Bay, makes the coast of Labrador cold and inhospitable, and the winds which blow over the icy waters tend to lower the temperature far inland.

In the case of the city of **Quebec**, the difference between the January and July temperatures* is about 56° (p. 302); the snowfall from October to April is very heavy, viz. 125 inches, and frost continues for a long period. The facts for Montreal are very similar.

The conditions at **St. John** and **Halifax** are modified, however, by the waters of the ocean; the difference between the summer and winter temperatures at St. John is 41°; the rainfall is more evenly distributed throughout the year, and the snowfall is much less than at Quebec.

At **Toronto** the climate is less severe than at Quebec or at Montreal; this is due to the modifying influence of the Great Lakes; although the average temperature in the winter months is below freezing point, the temperature often rises sufficiently to melt the snow; hence sports on the ice are not indulged in to the same extent as at Quebec. The northern part of Ontario is noted for forests, and in the southern part agriculture, dairy farming, and fruit growing are carried on.

(2) **Interior Lowlands.**—Distance from the sea tends to produce extreme climatic conditions; hence the climate is of the continental type. In this region low temperatures prevail in winter, and comparatively high temperatures in summer; the snowfall is moderate; the rain, which falls chiefly in the summer, is scanty in amount, and decreases in quantity towards the west. At Winnipeg the difference

*All temperatures are given in Fahrenheit degrees.

between the January and July temperatures is 70½°; at Prince Albert the difference is 66°.

The **total precipitation** at Edmonton (17 inches) is only

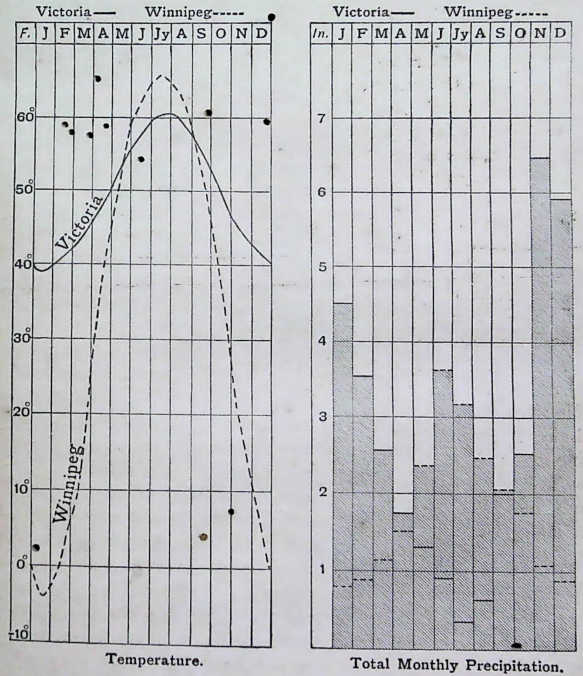


FIG. 11.—CONDITIONS OF CLIMATE AT VICTORIA AND WINNIPEG CONTRASTED.

half that at Toronto, but most of it falls in May, June, July and August—that is, during the period of growth. At Toronto, the rainfall is not only heavier, but it is more evenly

distributed throughout the year; much of the rain drains away, and the district has no great advantage over the west as regards agriculture.

It should be noticed that in the North-West Provinces winter changes rapidly into summer, *e.g.* in Winnipeg (page 19) the average temperature for March is 13° higher than for February; for April 23° higher than for March; for May 15° higher than April; for June 10° higher than for May. In the case of Toronto the corresponding temperatures would be 7°, 12°, 11°, 10°.

On the whole the climatic conditions on the prairie lands are eminently suitable for wheat cultivation. The south-western part of the region is somewhat dry for cereals, but, with the help of *irrigation* and *dry farming*, enormous crops have been raised during the past few years. In the northern part of the region the prairie gives way to sparse forest land in which conifers chiefly abound.

(3) **Interior Highlands.**—In this region are the Rocky Mountains, Selkirks, and Gold Mountains, with high, snow-covered peaks and deep valleys. On the west side of the ranges, the rainfall is heavy, the lower slopes being covered with forests; above the forests are grasslands; then vegetation of the tundra type occurs up to the snow-line. On the east side of the mountains the slopes are drier and barer. In the broader valleys agriculture and fruit growing can be carried on, but in some cases irrigation is necessary. In the **Okanagan, Kootenay**, and other valleys somewhat extreme conditions of climate are experienced, but these extreme conditions become less pronounced in the lower parts of the valleys.

(4) **Western Margin.**—The climate of this region is of the Marine type. The coast range runs along the Pacific seaboard right in the track of the westerly winds; hence there is a heavy rainfall at all seasons, but especially in the autumn and winter. The waters of the ocean tend to modify the average temperatures of summer and winter. At Victoria, continuous frosts are unknown, the average temperature for

January being 39°, and consequently the harbour is never icebound. The climatic conditions in this region are very similar to those on the coast of Western Scandinavia.

(5) **Northern Lowlands.**—In this region the conditions of climate are very severe owing to the high latitude, the exposure to Arctic winds, and to the slope of the land towards the north. Hence the winter lasts for more than eight months, and this is followed by a short summer, during which the daylight is almost continuous. The surface thaws to the depth of a few inches in summer, and the region then becomes a vast swamp for a short time. The vegetation of the tundras consists almost entirely of mosses and lichens on which the caribou feeds. The southern part of the Tundra region merges into the woodland of the temperate zone.

EXERCISES.

1. Victoria, Winnipeg, and Tadoussac (Fig. 13) are on or near latitude 49° N.

State the conditions of climate at each of these places, and account for the different conditions.

2. Examine the isotherms drawn on Fig. 8 (Winter Climate). Give some explanation of the course taken by each isotherm.

Compare these isotherms with those drawn on Fig. 9 (Summer Climate).

3. From Fig. 8 (Winter climate) and Fig. 9 (Summer climate) compare the distribution of rain in summer with the distribution in winter.

4. Write an account of Canadian rivers which rise in the Rocky Mountains.

5. Say what you know of the climatic conditions which prevail along the boundary (1) between Canada and the United States, (2) between Canada and Alaska.

LESSON IV.

COMMUNICATION.

1. In the subjoined table the freights (in 1000 tons) are given for the various canals for the period 1910-16. Draw a diagram (see Fig. 6) to represent these freights in order to compare the traffic through the canals.

TRAFFIC THROUGH CANADIAN CANALS.

CANALS.	1910	1911	1912	1913	1914	1915	1916
Sault Ste. Marie	36,396	30,952	39,670	42,699	27,600	7,751	16,813
Welland - -	2,326	2,538	2,852	3,571	3,861	3,062	2,545
St. Lawrence -	2,761	3,106	3,477	4,302	4,391	3,409	3,368
Chambly - -	669	600	618	556	437	479	399
Ottawa - -	385	320	392	365	335	272	238
Rideau - -	135	172	160	171	152	121	105
St. Peter's -	86	75	75	72	54	3	10

2. On an outline map of Canada draw the three trans-continental railways and mark the positions of the chief towns on each railway.

3. On a large map of Canada measure the shortest railway distance from Winnipeg to the following: Montreal, Vancouver, Halifax, Prince Rupert, Port Nelson.

Coast Line.—On looking at a map of the Dominion of Canada, it will be noticed (*a*) that the coast line is of enormous length, and (*b*) that it faces three oceans, the Arctic, Atlantic and Pacific. From the mouth of the River Mackenzie to Melville Peninsula the coast line lies within the Arctic Circle; to the north of it are numerous islands, such as Banks Land, Parry Island, Ellesmere Island, and many others, separated by channels which are rarely free from ice.

The **River Mackenzie** carries off the outflow of the Great Slave Lake and Great Bear Lake, but it crosses a region, frozen from October to June, and traversed only by fur hunters. It enters the sea far from the great centres of

population and from the trade routes of the world. Commercially therefore the Mackenzie is an unimportant river.

Hudson Bay.—The channels leading into Hudson Bay are only free from ice for a short period in the summer months; hence the shores are of little use for trade, although the route from Liverpool to Winnipeg *via* Port Nelson is 1000 shorter than the route *via* New York.

Atlantic Coast.—The coast of Labrador consists of rocky cliffs with a desolate hinterland; hence it is used only by fishermen and seal hunters. The chief approach to Canada from Europe is therefore along the St. Lawrence estuary to Quebec and Montreal and through the ice-free ports of Halifax and St. John.

Pacific Coast.—The Pacific coast of Canada is never obstructed by ice, but it is bordered by mountain ranges, which proved a serious obstacle to communication until railways were constructed to Vancouver and Prince Rupert.

Internal Communication.—In the interior of Canada, communication is carried on by means of rivers, lakes, canals and railways. The Indians transported their goods on the natural waterways, and when they came to waterfalls, rapids or shallows in the rivers, or low water-partings between the rivers, they carried their canoes and cargoes past the obstruction and then proceeded once more along the waterway. Such a method cannot be used when goods are being transported in large quantities as in the case of wheat grown on the prairie lands and sent in bulk to Montreal, or some other port, for export. Hence the Canadian Government has spent large sums of money in constructing canals to link up the various navigable waterways, and thus to provide through communication by water.

Canals.—The most important canals in Canada are the following:

(*a*) **Sault Ste. Marie Canal.**—Between Superior and Huron are the Sault Ste. Marie Canals (see p. 51), one belonging to the Canadian Government, the other to the United States. Enormous traffic passes through these canals. In one

season 185 million bushels of Canadian wheat were moved through the two canals; other articles, such as iron ore, coal, wood-pulp, timber and flour also passed through.

(*b*) **Welland Canal.**—This canal connects Erie with Ontario and thus the obstruction of the Niagara Falls is avoided (see Fig. 39). Although the traffic through this canal is considerable, it is much less than that through the Sault Ste. Marie Canal, as many vessels stop at Buffalo, Cleveland, and other lake ports, and do not pass into Lake Ontario at all.

(*c*) **St. Lawrence Canals.**—Between Ontario and Montreal, the St. Lawrence has been deepened in some places to provide a navigable channel, but where serious obstructions occur, canals have been constructed, such as the Grenville, Soulanges, Beauharnois, Lachine, and other canals. Hence vessels of moderate size can pass freely up or down this section of the St. Lawrence waterway.

(*d*) Of the less important canals the following may be mentioned:

The **Chambly Canal**, which helps to provide a waterway from Montreal to the R. Richelieu near Lake Champlain;

The **Ottawa Canal** from Montreal to Ottawa;

The **Rideau Canal** from Ottawa to Kingston on Lake Ontario;

The **St. Peter's Canal** from the Atlantic to Bras d'Or Lakes in Cape Breton Island.

Railways.—The rapid development of the Prairie Provinces and the linking up of the Pacific coast with the Atlantic coast have been brought about by the construction of railways. The prosperity of Canada depends very largely on the facilities of transport provided by the railways.

There are three trans-continental lines of railway in Canada:

(*a*) **Canadian Pacific Railway** (C.P.R.).—This railway has its eastern terminus at Montreal and its western terminus at Vancouver in British Columbia. An extension of this railway runs from Montreal to Quebec and a *short line*,

which passes through the State of Maine (U.S.A.), connects Montreal with St. John, thus giving access to tide water and to a harbour free from ice.

The Dominion Atlantic Railway, which runs through the Annapolis valley in Nova Scotia, now belongs to the C.P.R.

(*b*) **Grand Trunk Pacific Railway** (G.T.P.).—This railway has its eastern terminus at Moncton in New Brunswick and its western terminus at Prince Rupert in British Columbia. The section from Moncton to Winnipeg, with a branch running from the main line to Port Arthur on Lake Superior, is owned by the Dominion Government.

The section from Winnipeg to Prince Rupert (as well as nearly all other railways in Canada except the C.P.R.) is now under the control of the Government.

(*c*) **Canadian Northern Railway** (C.N.R.).—This railway connects Montreal with Vancouver. In the first section from Montreal to Port Arthur, it runs almost parallel with the C.P.R.; thence to Winnipeg it runs south of the C.P.R. From Winnipeg to Edmonton the C.N.R. runs north of the C.P.R. and G.T.P. It crosses the Yellowhead Pass, near Mount Robson, then turns south to Kamloops and proceeds to Vancouver along the River Fraser, but on the opposite side of the river to the C.P.R.

In addition to the trans-continental lines there are three other railways of importance.

(*a*) **Intercolonial Railway of Canada** (I.C.R.).—This railway, owned by the Canadian Government, connects Halifax and St. John with Montreal. The railways in Prince Edward Island and Cape Breton Island also form part of this system.

(*b*) **Temiskaming and Northern Railway** (T. and N.R.).—This railway begins at North Bay (the eastern end of Lake Nipissing) and ends at Cochrane. This line with its branches taps the mining fields of Cobalt, Porcupine, and others.

(*c*) **Grand Trunk Railway** (G.T.R.).—This railway has many branches in Ontario and Quebec, but its main line is in the United States, connecting Portland in Maine with Chicago.

EXERCISES.

1. State the position and importance of each of the canals given in the table on page 28.

2. Describe the coast line of Canada from the Gulf of St. Lawrence to the mouth of the R. Mackenzie.

3. Explain the terms *transcontinental* and *intercolonial* as applied to railways. Give one example of each in Canada, and point out its importance.

4. Why have railways played such an important part in the development of Canada?

5. Name the ice-free ports of Canada, and show how they are connected with Montreal by rail.

6. Compare Montreal and Winnipeg as centres of traffic.

LESSON V.

THE MARITIME PROVINCES.

1. Draw a large sketch map of the Maritime Provinces, and on it enter the chief cities. In the case of Nova Scotia and New Brunswick mark also the chief railways.

2. Measure (*a*) the greatest length of Nova Scotia, the area of (*b*) Prince Edward Island and (*c*) Cape Breton Island respectively. (The coast line of each should be traced on transparent squared paper and the areas should be calculated from the scale of the map.)

3. If a ship canal connected the Bay of Fundy with Northumberland Strait, how many miles would a steamer save in going from St. John to Charlottetown?

The Maritime Provinces.—These comprise (*a*) New Brunswick, (*b*) Nova Scotia with Cape Breton Island, and (*c*) Prince Edward Island. The inhabitants of these provinces are mainly of British descent, although some families trace their descent from the early French settlers.

New Brunswick.—This province has two coast-lines—one

on the Bay of Fundy, the other on Northumberland Strait; the coast-lines are separated by an isthmus only sixteen miles across. The funnel-shaped Bay of Fundy, situated between Nova Scotia and New Brunswick, is noted for its high tides; the difference between high water and low water is often as much as sixty feet. The highest part of New Brunswick is in the north-west, where the land rises to a height of nearly 2,500 feet; the rest of the country is low-lying. The chief river is the St. John, which is navigable from its mouth to the Grand Falls, a distance of over two hundred miles.

New Brunswick consists largely of **forest land**, and **lumbering** is the chief industry of the province; pine is now scarce, but spruce is abundant. The Government owns more than ten thousand square miles of forests, and strict regulations are in force with a view to the preservation of the forests. Large numbers of people are now employed in the cotton mills, tanneries and boot factories of New Brunswick.

As a rule, men who emigrate to Canada to become farmers do not settle in New Brunswick, where they would have to clear the land for agriculture, but they go to the open prairie lands of the west, where free grants of land can be obtained. Fishing is the second New Brunswick industry of importance.

St. John, the largest city of New Brunswick, is a winter port for Canada, and is noted for its saw-mills. Two important railways now connect St. John with Montreal (p. 31).

Moncton on the Petitcodiac River is a port of entry into New Brunswick. The Grand Trunk Pacific Railway starts from Moncton to cross Canada to Prince Rupert on the Pacific coast.

Fredericton on the River St. John is the capital of New Brunswick.

Nova Scotia.—Nova Scotia (New Scotland) was called Acadia by the French until it was finally ceded to Great Britain by the Treaty of Utrecht in 1713. Mountain ridges run parallel to the length of the peninsula, but they rarely exceed one thousand feet in height. Being nearly surrounded by water, the climate of Nova Scotia is humid; the harbours

are, moreover, free from ice throughout the year, but fogs frequently hang over the Atlantic coast. Some parts of the peninsula are still covered with forests, but the best soils have long been cleared and cultivated. The **Annapolis** valley in the south-west is the most fertile district, and is specially noted for apples; more than a million barrels of apples are produced yearly in Nova Scotia.

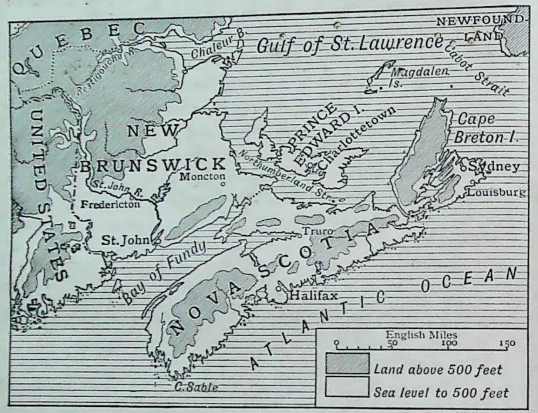


FIG. 12.—THE MARITIME PROVINCES.

Coal is mined in the north; and gold, iron, and gypsum are obtained in other parts.

A large number of people are engaged in catching lobsters on the rocky coast, and in cod fishing on the Banks of Newfoundland.

Halifax stands on a fine natural harbour; it is a coaling station for the British fleet and a winter port for Canada when the St. Lawrence is frozen. Halifax is now fortified and garrisoned by the Canadian Government.

Cape Breton Island is nearly divided into two parts by an inlet called Bras d'Or. The island is noted for coal and iron mining and for fishing. Sydney is the chief town.

Sable Island, a dangerous stretch of sand twenty miles long, rises above the waters of the Atlantic about 85 miles to the east of Halifax.

Prince Edward Island.—This island is separated from the mainland by Northumberland Strait, which is ten miles across at its narrowest part. The surface of the island nowhere exceeds 500 ft. in height. As the soil is good, nearly the whole island is well tilled, and most of the inhabitants are engaged in agriculture, oats and barley being the chief crops. Dairy farming and horse rearing are now becoming important. The coast-line is deeply indented; in the rocky bays, near Charlottetown, lobsters are caught; and in Richmond Bay the oyster beds cover 15,000 acres. **Charlottetown** on the south coast is the capital of the island.

EXERCISES.

1. Account for the following facts: (1) that the harbours of Halifax and St. John are not frozen in the winter, (2) that the tide at St. John is much higher than the tide at Halifax.

2. Give the position and importance of: Halifax, St. John, Moncton, Sydney.

3. Say what you know of the following industries in the Maritime Provinces: lumbering, fishing, agriculture, mining.

LESSON VI.

ST. LAWRENCE—NEWFOUNDLAND.

1. Draw a sketch map of the St. Lawrence estuary, and on it mark the positions of the chief towns and the mouths of the chief tributaries.

2. Measure the distance by water (1) from Montreal to Belle Isle, (2) from Quebec to St. John's.

3. On transparent squared paper trace the island of Newfoundland, and find its approximate area.

4. Make a list of the cities mentioned in this lesson and opposite each, state its latitude and longitude.

The St. Lawrence.—The River St. Lawrence and the Great Lakes afford a natural waterway from the Atlantic into the heart of North America. There are two approaches to the Gulf of St. Lawrence from the ocean: (1) the Strait of Belle Isle between Newfoundland and the coast of Labrador; (2) Cabot Strait between Cape Breton Island and Newfoundland.

Cabot Strait is never closed to navigation, but when the St. Lawrence is frozen ships go to the harbours of Halifax and St. John (N.B.).

During the winter months the **Strait of Belle Isle** is blocked with ice, and it is not open until the summer is well advanced. The navigators of the sixteenth century all approached Canada by way of the Strait of Belle Isle, as they made their voyages only in the summer months. Near the entrance of the strait is a grass-covered island (Belleisle) eight miles long with high granite cliffs rising from the sea. From this island to the city of Quebec is a journey by steamer of about a thousand miles. Entering the strait, which is only ten miles wide at its narrowest part, a ship would pass on one side the coast of Labrador, with curving bays and rounded hills covered with scanty pine woods; here and there a cluster of fishermen's huts or a small lumber camp might be seen. On the Newfoundland side, there would be a dreary stretch of coast on which a few French fishermen dry their fish and mend their nets. The water channel then broadens out into the Gulf of St. Lawrence, and rounding **Cape Whittle**, the ship would steam for many miles in a due westerly direction, passing the north side of Anticosti in fair weather; in stormy weather it is safer for ships to pass south of the island. **Anticosti** has no good harbour; its low barren shores rise inland to wooded ridges.

St. Lawrence Estuary.—The broad estuary of the St. Lawrence is now reached. On the north side there seems to be a continuous wall of mountains, really the edge of the Laurentian plateau; on the south side is the Notre Dame range, the northern continuation of the Appalachian Highlands. In many cases, where the tributaries meet the St. Lawrence, towns or villages are situated. They are the outlets of the forest lands, the timber being brought down

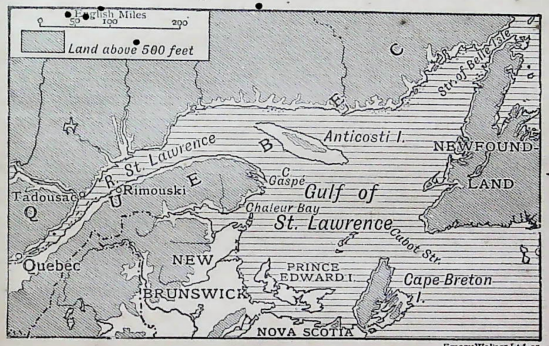


FIG. 13.—THE GULF OF ST. LAWRENCE.
The name Tadousac is also spelt Tadoussac.

the rivers to the St. Lawrence. From the junction of the Saguenay to Quebec the channel rapidly narrows until both banks are plainly seen. The scenery on the north bank is, however, more imposing than that on the south. Passing the **Isle of Orleans**, Quebec is seen towering high above the river near the junction of the River Charles and the St. Lawrence. Between Quebec and Montreal the scenery becomes tamer, especially on the south side; the river is now only a mile wide, except in **Lake St Peter**, a broadening of the stream just above Three Rivers. **Montreal**, 170 miles above Quebec, is on an island at the junction of the Ottawa

and the St. Lawrence. This is the head of navigation for ocean steamers. Between Montreal and Lake Ontario the navigation of the St. Lawrence is obstructed by the **Lachine rapids**, which can be traversed by steamers going down stream. Steamers going up stream, however, pass through canals which link the navigable reaches of the river (p. 30). Just before Lake Ontario is reached the picturesque **Thousand Islands** are passed.

Newfoundland.—Newfoundland is an irregular-shaped island a little larger than Ireland. The coast-line is deeply indented; the peninsula of **Avalon**, on which St. John's is situated, is nearly separated from the rest of the island by **Placentia Bay** and **Trinity Bay**. The interior of the island consists of glaciated rocks, in the hollows of which are numerous lakes; the highest land is known as the **Long Range**; it is situated in the west and slopes steeply to the coast. The tops of the hills are usually bare; in the valleys, pine, larch, spruce, and other trees grow, and wood pulp is prepared as an article of export. Some parts of the interior are suitable for agriculture, but little progress has been made because the fisheries offer a more promising occupation. Iron, copper, coal, and other minerals are known to exist, but at present the mining industry is not very important.

Fishing.—The people of Newfoundland depend largely on the cod fishery for their subsistence. The Grand Banks stretch to the south-east of Newfoundland; they are formed partly of rockwaste dropped by icebergs on the continental shelf. On these banks the **cod** finds its food, and it can be caught by means of lines with baited hooks attached to them. The fishing season, which lasts from the beginning of June to the end of October, is carried on under great difficulties, such as rough water, danger of icebergs, fogs, and low temperature. Some of the cod is packed in barrels with salt, some is hung up to dry and is then called *stock fish*; **oil** is extracted from the liver, and **isinglass** is prepared from the bladder while the roe of the cod is used as **bait** in other fisheries. **Lobsters** caught in the fjords of Newfoundland are canned for export.

On the coast of **Labrador** are few permanent settlements. In the season many thousands of fishermen from Newfoundland, Canada and the United States, visit the fishing grounds in quest of cod, herring, seals, etc.

People and History.—Newfoundland was discovered by John Cabot, who sailed from the port of Bristol in 1497. The attempts of Gilbert and Baltimore to colonise the island failed, but fishermen from England, France, Portugal, and Spain went every year to the fishing grounds. By the Treaty of Utrecht (1713) Newfoundland was acknowledged to be British, but French fishermen were to have the right of drying their fish on the north-west coast, known as "*the French shore.*" This arrangement afterwards led to many disputes which were at length settled by the Anglo-French Convention of 1904. The French still hold the two islands **St. Pierre** and **Miquelon.**

Newfoundland, with a strip of the mainland called Labrador, is not included in the Dominion of Canada, but has a separate administration under a Governor, Council, and Representative Assembly. **St. John's** is the capital.

EXERCISES.

1. Describe a journey by water from Montreal to St. John's.
2. Write notes on: Belleisle, Anticosti, and St. Pierre.
3. Write an account of the St. Lawrence as regards scenery and commercial importance.
4. Give a description of Newfoundland, with special reference to relief, industries, and people.
5. The exports from Newfoundland are valued at about two million pounds sterling. The chief exports are derived from the following fisheries:

	£1000.		£1000.
Cod, - -	1,567	Seal, - -	137
Herring, -	47	Whale, -	34
Lobster, -	68	Other Fish, -	6
Salmon, -	9		

The exports from the mines of Newfoundland are valued at 238 thousand pounds sterling.

Make a percentage table of the exports given above, and write brief notes on each of the exports.

LESSON VII.

THE PROVINCE OF QUEBEC.

1. Draw a sketch map showing (*a*) the chief tributaries which enter the St. Lawrence on the north bank, (*b*) the watershed from which these tributaries flow, (*c*) the settlements at the mouths of the tributaries.

2. Draw a sketch map to show the chief railways which radiate from Quebec and Montreal respectively.

3. From the tables (p. 303) showing the distribution of temperature and precipitation of Quebec and St. John respectively, draw diagrams similar to Fig. 11.

Under the diagrams write (*a*) the range of temperature of Quebec and St. John respectively (*i.e.* the difference between the maximum and minimum temperatures), (*b*) the difference in annual rainfall at Quebec and St. John, (*c*) the difference in annual snowfall at Quebec and St. John.

The province of Quebec.—This province consists of three natural divisions: (1) the plain of the St. Lawrence, (2) the Highlands south of the St. Lawrence, and (3) the Laurentian Plateau and the lands to the north of it.

The **plain of the St. Lawrence** comprises a narrow strip of land on both sides of the estuary and, above the city of Quebec, an extensive stretch of lowland (Fig. 16). As a rule, the land is open and clear of timber up to the foot of the hills, and is used for agriculture and pasturage. The chief cities are all situated in this part of the province.

The **Highlands south of the St. Lawrence** are the northern extension of the Appalachian highlands; and, like them, form a series of parallel ridges of rock. The highest of these ridges are called the **Notre Dame Mountains**, and between the ridges

are deep longitudinal river valleys. The lower slopes of the hills are cultivated, but the higher parts are thickly wooded.

The **Laurentian Plateau** has an elevation of 600-2000 feet above sea-level; it is a glaciated region, the surface of which now appears as hard rocks with little soil upon them; the highest parts are bare rounded hills. In the depressions of the plateau are lakes of clear water from which streams

FIG. 14.—KIPAWA LAKE, PROVINCE OF QUEBEC.
Returning to camp with a moose's head. (By courtesy of the C.P.R.)

flow over rocky beds to the St. Lawrence, or to Hudson Bay. On reaching the edge of the plateau, the rivers plunge down to the plains below in a series of beautiful waterfalls. The **Montmorency Fall** near Quebec is a well-known example of such falls. Where there is sufficient soil, especially near the lakes and rivers, are large forests of pine, spruce, larch, and other trees.

The vast territories which stretch from the plateau to the shores of Hudson Strait and to the eastern side of Hudson

Bay have not been explored at all thoroughly; the mineral wealth of the region is known, however, to be enormous, although as yet it is undeveloped.

People.—Nearly all the people in the Province of Quebec live near the banks of the St. Lawrence or on the plain above Quebec. The majority of the people are of **French descent** and French is spoken everywhere. French customs, French laws, and the Roman Catholic religion, are all recognised by the British Government. The earlier settlers in the St. Lawrence valley divided the land, after the French plan, into long narrow strips with a narrow side facing the river. The French Canadian usually builds a one-storied house with curving roof and broad verandah, and it is often painted with bright colours. Above Quebec are many large country houses built in fine positions overlooking the St. Lawrence. From April to October the farmers work early and late; but in winter, owing to the severity of the weather, outdoor work is impossible, and so it is a time of leisure and enjoyment. Many men are engaged in the lumber trade and in the wood-pulp industry; as a rule, the trees are cut down in the winter and dragged over the ice and snow to the nearest river to be floated down in the spring.

The province of Quebec is now visited by rich Americans and Canadians for recreation and sport; they fish for salmon and trout in the lakes and streams; or they shoot moose, bear, deer, and other animals in the forests and on the moorlands.

Cities.—**Quebec,** at the junction of the Rivers St. Charles and St. Lawrence, is one of the oldest cities in North America; it was founded by Champlain in 1608. The position of the French fortress on the rock which towers above the river was of strategic importance. Quebec is noted for its historical associations, its quaint streets, and old-world buildings. In population and commercial activity, Quebec has been outstripped by Montreal and Toronto. On the opposite side of the St. Lawrence is Levis, from which the Grand Trunk Pacific Railway runs to Moncton. The new Government

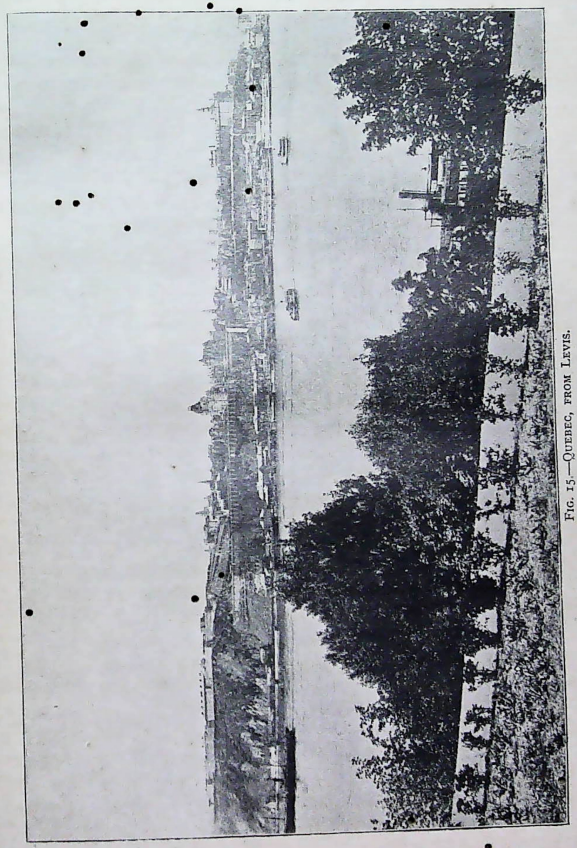


FIG. 15.—QUEBEC, FROM LEVIS.
(By courtesy of the C.P.R.)

dry dock at Levis is capable of accommodating the largest vessel afloat.

Eight miles above the city of Quebec, a great railway bridge now crosses the St. Lawrence. The central span, 640 ft. long, was placed in position in September, 1917, thus completing the construction of the bridge.

Below Quebec at the mouth of the River Montmorency, is the city of **Ste. Anne de Beaupré**, a noted pilgrim resort.

Murray Bay, a town named after the first British governor of Canada, stands on a fine bay formed by a gap in the cliffs; it is a noted health resort, as the summer climate is cool and bracing.

Tadoussac, at the mouth of the Saguenay, was occupied by the French as a trading post before the founding of Quebec. Behind it are sand ridges and pine forests, and logs are brought down the Saguenay for export. Tadoussac is at the end of the regular passenger navigation on the north shore of the St. Lawrence. East of it are a few rivers noted for salmon fishing, and a few settlements with pulp mills.

River Saguenay.—From the mouth of the Saguenay to the Lake St. John is about one hundred miles; the river runs between high rocky banks on which there is little vegetation. The water of the river is very cold and there are few fish in it. Steamers pass up the Saguenay from Tadoussac to Chicoutimi, the head of navigation. **Chicoutimi** is a lumbering town with saw mills and lumber yards; pulp mills have been erected by American firms. A railway proceeds to Lake St. John, and from the lake there is a direct line of railway to Quebec; hence many ourists take a circular trip viz. Quebec, Tadoussac, Lake St. John, and then back to Quebec.

The district round **Lake St. John** is like an oasis in the dreary wastes of the interior of Quebec. About forty thousand people, mainly French, live around the lake and successfully cultivate the soil; salmon and trout are caught in the lake and streams. From Lake St. John a trail leads to James Bay, along which surveys have been made for a projected railway.

St. Lawrence Estuary.—On the south side of the St. Lawrence, towns, villages, and farms extend much further east than on the north side. On the green hill slopes which rise from the river, farm buildings and private houses are seen; on the coast are many small towns, such as **Rivière de Loup, Cacouna, Rimouski**, and others—they are the outlets for

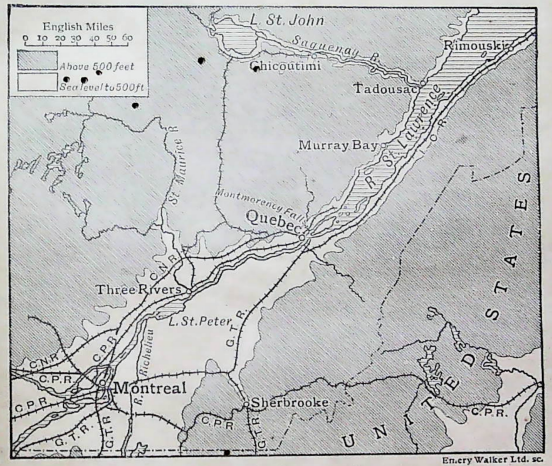


FIG. 16.—THE ST. LAWRENCE VALLEY.
Tadousac is also spelt Tadoussac.

the timber cut on the **Notre Dame Mountains.** The Intercolonial Railway runs through them.

The Eastern Townships.—The district of the Eastern Townships stretches eastwards from the St. Lawrence between Quebec and Montreal to the borders of Maine and Vermont; **Sherbrooke** and **Richmond** are the chief cities. This district was practically unoccupied until the end of the eighteenth century, when the land was settled by loyalists

from the American States. The beautiful valley of St. Francis has some of the best farms in Canada; between Richmond and Montreal the land provides pasturage for the cattle on the dairy farms. At Sherbrooke some of the settlers from the New England States introduced the woollen

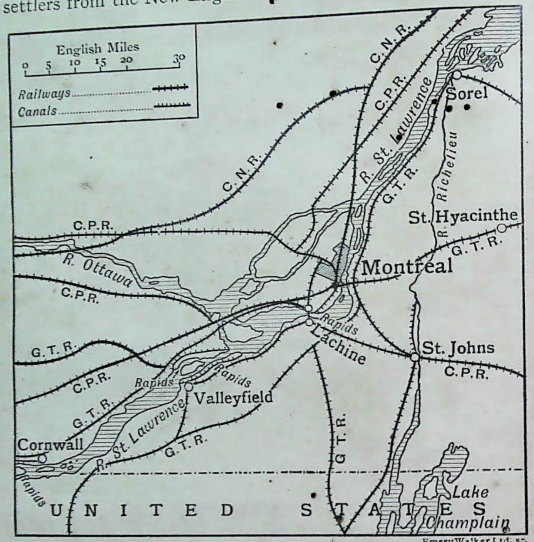


FIG. 17.—MONTREAL.

Note the position of Montreal where rivers and railways meet.

and linen manufactures, because of waterpower derived from the Rivers St. Francis and Magog.

Three Rivers at the mouth of the St. Maurice was founded only ten years after Quebec; nearly all the inhabitants are of French origin. Three Rivers is noted for its lumber trade, and near it are large wood-pulp mills.

Montreal (Mount Royal) stands on an island in the St. Lawrence near the junction of the River Ottawa with the St. Lawrence. Cartier visited the site of Montreal in 1535, but no permanent settlement was made until 1642, when a number of French settlers arrived, some to trade in furs with the Indians, and others to establish religious houses for the conversion of the Indians. For a long time Montreal remained a French outpost. Soon after Canada became a British possession (1763) many Englishmen and Scotsmen settled in Montreal, and to them and their descendants is largely due the rapid commercial progress of the city. Montreal is now the head of navigation of the St. Lawrence for ocean steamers; fine docks, wharves, and piers provide ample accommodation for the ships which enter the port. Montreal is the headquarters of the two great Canadian railways, viz. the Canadian Pacific and the Grand Trunk. A tunnel, three miles long, constructed by the Canadian Northern Railway, passes under Mount Royal into the heart of the city. Montreal is noted for its medical schools and for McGill University, richly endowed by Scottish Canadians.

EXERCISES.

1. "Quebec is often referred to as the *French* province of Canada." Write any facts which explain this statement.

2. State the position of the following cities: Montreal, Quebec, Tadoussac, Sherbrooke. In each case explain why a town was founded at that particular place.

3. Write brief notes on: (*a*) the Eastern Townships, (*b*) Lake St. John, (*c*) Notre Dame Mountains, (*d*) the Laurentian Plateau.

4. Describe the chief productions and industries of the Province of Quebec.

5. Compare Montreal and Quebec as commercial centres.

6. Compare the climatic conditions which prevail at Quebec and St. John respectively.

LESSON VIII.

PROVINCE OF ONTARIO.

1. Draw a sketch map of the Lake Peninsula and mark the chief towns and industries.

2. Find the most southerly position in Canada, and state its latitude.

3. On a sketch map of the Province of Ontario mark the watershed which divides the drainage into the Great Lakes from that into James Bay and Hudson Bay. Shade that part of Ontario which is most densely populated.

The Province of Ontario.—The population of Ontario is almost entirely of British descent; this is largely due to two facts: (1) that after the American War of Independence many refugees from the States (known as United Empire Loyalists) settled in Ontario and founded the towns of Toronto and Kingston; (2) that at the end of the Napoleonic wars in 1815 many British officers and soldiers obtained grants of land in Ontario. The people of the province live chiefly in the lake peninsula between Erie and Huron and in a strip of land forty to fifty miles wide along the northern shore of Ontario and the northern bank of the St. Lawrence.

At the time of the Crimean war, England relied on Russia for imported wheat; the stoppage of that supply led to a great development of wheat growing in Ontario, and much forest land was cleared for this purpose. The opening of the Canadian Pacific Railway (1885) made it possible for emigrants from Europe, and for the younger sons of farmers in the eastern province to go westwards where the rich fertile soils in Manitoba, or in Saskatchewan, were ready for ploughing.

Farming.—Wheat, barley, and other crops are still grown in Ontario, but dairy farming has now become very important; good breeds of cows, sheep, and pigs are kept in the agricultural area. Milk from the dairy farms is taken to

factories where butter and cheese are made in a scientific manner; large quantities of these articles are now exported.

In the **lake peninsula**, the most southern part of Canada, fruit is grown in immense quantities; peaches, pears, apples, tomatoes, and many others are packed in cans or in bottles for export. **Hamilton** on Lake Ontario and **St. Catherines** are important centres for this industry.

The **mineral wealth** of Ontario is very great; the most productive mines are those for copper and nickel in the **Sudbury** district, silver at **Cobalt**, and gold at **Porcupine.** Many Chinese coolies are employed in the mining operations at Sudbury and Cobalt.

Cities.—**Ottawa** owes its origin to a small lumbering settlement (called Bytown) near the Chaudière Falls, the head of navigation on the River Ottawa. In 1827 the Rideau Canal was opened connecting the River Ottawa, about one mile below the Falls, with Lake Ontario. This canal was constructed to enable ships to pass from the Great Lakes to the St. Lawrence at Montreal without going too near the United States frontier. The opening of this canal and the increase of the lumber trade brought prosperity to the settlement. In 1860 it was chosen as the capital of the Province of Canada, and the name Bytown was changed to Ottawa; in 1867 it became the capital of the confederation known as the Dominion of Canada. The commercial importance of Ottawa still depends on lumbering; the water-power of the **Chaudière Falls** is used for driving the machinery of the sawmills and for generating electricity with which the city is lighted.

Toronto stands on a bay at the north-western end of Lake Ontario; the bay is sheltered by a long narrow island which forms a natural breakwater. The position of Toronto is suitable for the great shipping industry on the lakes; it is near the richest land of the province, and it has good railway communication by means of the Canadian Pacific, the Grand Trunk, and the Canadian Northern Railways. Toronto is the capital of the province of Ontario.

The **country towns** of Ontario do not resemble market towns in England, because water-power is so abundant; hence even small places have electrical works, sawmills, flour mills, butter factories, etc. Agricultural implements are made not only in the city of Toronto but also in **Brantford, Peterborough, Galt, Kitchener,** and **London.** The manufactured goods of Ontario are used in the province itself, and many articles are sent to the north-west provinces of Canada, to the eastern provinces and to the United States.

That part of Ontario which stretches to the north of Lakes Huron and Superior is a vast network of lake, stream, and forest; the soil is poor, rough and rocky, and hardly worth the labour of clearing. Few people live in this region, but in summer sportsmen visit it for the sake of the shooting and fishing. Great mineral wealth is known to exist, but at present it is undeveloped. A large district, known as the **Great Clay Belt,** is crossed by the Grand Trunk Pacific Railway, and it extends westward for about 400 miles from the inter-provincial boundary between Ontario and Quebec. This clay belt consists of good arable land, and many farmers have already settled there.

(For an account of the Niagara Falls, see pp. 98-9.)

Communication.—(1) **Montreal to Winnipeg** by the C.P.R. From Montreal the railway runs near the southern bank of the River Ottawa, passing through a flat district in which are cedar swamps and forests. After leaving the city of Ottawa the railway follows the river valley for some distance, and then turns westward and skirting the north side of Lake Nipissing, reaches Sudbury. From Sudbury westwards, the railway traverses a rugged wilderness of rock, lake, and illimitable stretches of pine, spruce, and tamarisk forests. In summer, fires often reduce the forests to blackened poles; in winter the whole district is snow-covered and the scenery is monotonous. When the railway reaches the shores of Lake Superior (at Heron Bay) the journey onwards to Fort William is noted for its magnificent views. **Port Arthur** is first reached; this city was built by the C.P.R. as a depot

and as a lake port but it was afterwards abandoned in favour of Fort William. After some years, the Canadian Northern Railway made Port Arthur its lake terminal, while the Grand Trunk Pacific assisted in developing the traffic of the place.

Fort William was in former days an important trading station of the North-West Fur Company of Montreal; it is situated on a flat swampy site, but a good position for a business mart. Instead of loading furs, steamers now receive

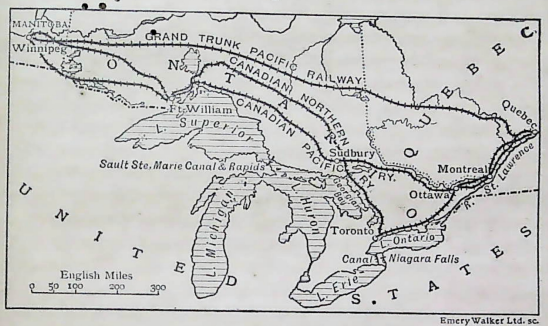


FIG. 18.—RAILWAY ROUTES FROM QUEBEC AND MONTREAL TO WINNIPEG.

Manitoban, Saskatchewan, and Albertan wheat from some of the biggest elevators in North America.

Between Fort William and Winnipeg, a distance of about 400 miles, the railway traverses the Rainy[1] River District and passes the north shore of the Lake of the Woods; in this dreary area of forest and lake many Finns have settled, the conditions of life in this district being very similar to those in Finland.

Within forty or fifty miles of Winnipeg the forests that cover the eastern half of North America (except where cleared

[1] Rainy, a corruption of René, the name of a French explorer and trader.

by the settler's axe) give way to the first patches of prairie. A flat agricultural country, half prairie, half woodland, sparsely settled, carries the traveller into Winnipeg.

(2) **Montreal to Fort William and Port Arthur** by the Lakes.—An alternative route from Montreal to the west is by train through Toronto to **Owen Sound**, Port M'Nicoll, or Collingwood on Georgian Bay, where steamers start on the journey across Huron and Superior. Stormy weather is often met with, and the navigation of the lakes is somewhat difficult; the steamer passes through many narrow channels between wooded islands. There is much traffic on Lake Huron, chiefly in grain and timber.

The River **Sainte Marie** connects Huron and Superior, but its channel is obstructed by a waterfall nearly a mile across known as **Sault Ste Marie** (or the Soo). On either side of the watercourse is a ship canal along which towns are rapidly growing into importance; some of the largest wood-pulp mills in North America are situated here, and there is an important steel industry. A railroad from the Soo to James Bay is projected. It is three hundred miles across Lake Superior from the Soo to **Thunder Bay** on which stand Port Arthur and Fort William. The passage across the lake is often dangerous owing to fogs. Thunder Bay is a fine horse-shoe bay with barren hills rising from the water.

(3) **Quebec to Winnipeg.**—The main line of the Grand Trunk Pacific Railway runs from Quebec to Winnipeg, passing through the unsettled forest lands of the provinces of Quebec and Ontario. The districts traversed by this railway are known to be rich in minerals. At **Cochrane** railways from Montreal and Toronto join the main route.

EXERCISES.

1. Compare the routes of the following railways: (*a*) C.P.R. from Montreal to Winnipeg, (*b*) G.T.P.R. from Quebec to Winnipeg.

2. From the tables showing the distribution of temperature and precipitation at Toronto and Montreal respectively (p. 302), compare the climate conditions of these places.

3. "The trade of Ontario is partly carried on by means of lake traffic." What lakes are referred to in this statement? Say what you know of the (water) channels connecting these lakes.

4. In what circumstances was the Province of Ontario settled? Account for the importance of Ottawa, Toronto, Fort William.

5. What manufacturing centres are there in Ontario? Of what importance are they?

6. What is the shortest distance between Georgian Bay and Lake Ontario? Of what advantage would it be to connect these by means of a ship canal?

LESSON IX.

PRAIRIE PROVINCES.

1. Measure the following distances:

   (*a*) From the International Boundary Line to latitude 60° N. (taking one degree as 69½ miles).

   (*b*) From Winnipeg to Edmonton.

   (*c*) From Winnipeg to Fort Nelson.

2. Draw a sketch map of the prairie provinces, and mark roughly the three divisions mentioned in this lesson (p. 56). Enter the names of the chief towns, and connect them with the main railway lines.

3. From the subjoined table find the total quantity of wheat, oats, barley, and potatoes produced in Canada. Draw a column ten inches high to represent the production of wheat; then draw columns proportionately high to represent oats, barley, and potatoes respectively.

CHIEF FIELD CROPS OF CANADA.

Province.	Fall Wheat.	Spring Wheat.	Oats.	Barley.	Potatoes.	Turnips, Mangolds, etc.
	1000 bush.	1000 bush.	1000 bush	1000 bush.	1000 bush.	1000 bush.
Nova Scotia, -	—	256	2,898	143	6,223	4,698
New Brunswick,-	—	241	5,710	70	7,204	3,152
Prince Edw. Is.,-	—	559	5,969	125	5,508	3,432
Quebec, - -	—	1,035	34,917	2,292	15,752	4,019
Ontario, - -	16,825	2,192,	90,285	14,290	18,676	48,525
Manitoba, - -	266	53,011	49,190	12,427	4,648	1,101
Saskatchewan, -	46	94,292	94,685	7,106	4,993	2,769
Alberta, - -	4,894	21,761	47,588	4,338	4,240	989
British Columbia,	163	167	2,196	98	3,135	1,353

4. What percentage of the wheat grown in Canada comes from Ontario, Manitoba, Saskatchewan, and Alberta respectively? For the same provinces make also a percentage table for oats and barley.

The Prairie Provinces.—The great provinces of **Manitoba, Saskatchewan,** and **Alberta** extend northwards from the international boundary line (lat. 49° N.) to lat. 60° N.; Manitoba is partly bounded by the shores of Hudson Bay. The whole of the prairie region is studded with lakes which lie in rock basins due to the glaciated state of the country. From the Rocky Mountains the general slope of the region is to the east and north-east. The Rivers Peace, Athabaska, and others, flow from the glaciers of the Rocky Mountains into the Mackenzie and so reach the Arctic Ocean. The North and South Saskatchewan first unite and then flow into Lake Winnipeg, from which the River Nelson carries off the overflow into Hudson Bay. The Red River, which rises south of the international boundary line, also enters Lake Winnipeg.

Winnipeg.—Down to 1870 Winnipeg was an important trading post (**Fort Garry**) of the Hudson Bay Company surrounded by groups of settlers, mostly Scottish Highlanders, who had been brought out in 1812 by Lord Selkirk; the settlement was then known as the **Red River** settlement. The

fertility of Manitoba was known, but the Hudson Bay Co. discouraged farmers. In 1870 the Dominion Government took over the rights of the company, and Manitoba was thrown open to agriculturists. The opening of a railway from St. Paul and soon afterwards one from Montreal (C.P.R.) made it possible for emigrants to reach Winnipeg without difficulty. Winnipeg, at the junction of the Assiniboine and the Red River, commands the plain between the international frontier and the southern end of Lake Winnipeg (a distance of about 90 miles). All routes from the eastern provinces of Canada to the west must pass through or near Winnipeg, unless a route be taken round the northern end of Lake Winnipeg, that is, three hundred miles north of the city of Winnipeg.

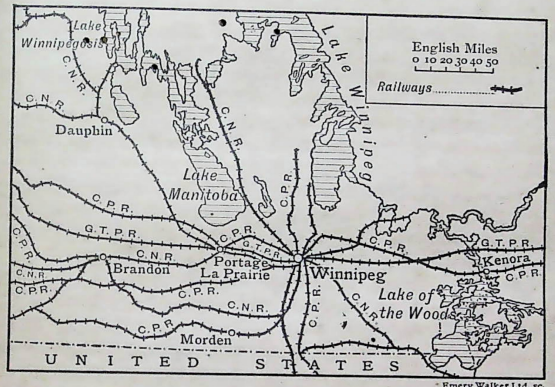


FIG. 19.—THE CHIEF RAILWAYS WHICH RADIATE FROM WINNIPEG.

The rapid progress of Winnipeg is due almost entirely to railways and to the consequent development of the prairie lands. It has become the distributing point for the west and north-west parts of Canada; it is also the centre through

which the products of the north-west pass on their way to the St. Lawrence valley for export. Winnipeg also manufactures articles which are required by the farmers in the North-West, and it will therefore become a rival of the manufacturing centres of Ontario. Coal and various metals are found in the south-west part of Manitoba.

The prairie provinces may be considered in three parts: (1) the southern belt crossed by the C.P.R. from Winnipeg to Calgary—the most highly developed portion of the region. (2) The lands crossed by the G.T.P., C.P.R. and C.N.R. from Winnipeg to Edmonton—a district not yet settled, but to which emigrants are going in large numbers. (3) The northern belt between lat. 54½° and lat. 60° N.—a district almost uninhabited.

Winnipeg to Calgary.—For thirty or forty miles west of Winnipeg the land is very flat (it is the bed of an old lake, Lake Agassiz), and artificial drainage is necessary; herds of milch cows are kept on this land, and large quantities of hay are obtained; agriculture is being developed. Near **Portage la Prairie,** however, the scene changes; well-cultivated fields of wheat and oats come into view, as well as broad roads with ditches on either side and many substantial homesteads; and steam ploughs and steam threshing machines will be seen according to the season of the year. After many years of cropping the deep, black soil remains unimpaired. A dozen miles north of Portage is Lake Manitoba, a hundred miles long, near which is good shooting for duck and grouse.

Between Portage and Brandon, sandhills, partly covered with pine, stunted evergreens, and willows, rise from the prairie, and small lakes fringed with reeds lie in the hollows. Before getting to Brandon the prairie takes an upward step, the heavier lands of the Portage district get considerably lighter, and the contour of the country is no longer a plain, but resembles the undulating lands of the South of England.

Brandon, on the Assiniboine River, is the second city of importance in Manitoba and it is the centre of a vast agricultural district.

From Brandon westwards the C.P.R. crosses the prairie, which is intersected by streams; many of these streams flow between steeply wooded banks to meet the Assiniboine or the Souris. Entering the province of Saskatchewan, the railway proceeds to Regina, which stands on the open prairie. **Regina** is an important distributing centre for

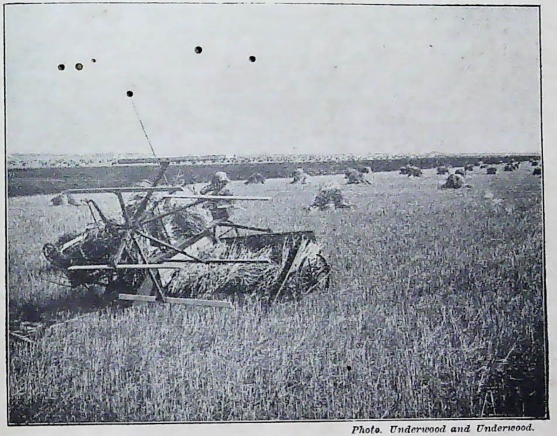


Photo. Underwood and Underwood.

FIG. 20.—A PRAIRIE HOME AT HARVEST-TIME.
Note the distant view across the Prairie.

Southern Saskatchewan; it will be seen from the table on page 54 that Saskatchewan is now the greatest wheat-producing province of Canada.

Grain Elevators.—In passing through the towns and villages of the Prairie Provinces the traveller would see huge structures called grain elevators. The western farmer does not put his grain into sacks, but he brings it in bulk to the elevator, and the elevator loads the grain into the cars (or railway trucks). Some elevators are used for storing

wheat, others for inspecting and grading it. At Fort William and Port Arthur are terminal elevators, so called because the inspection of grain from the west ends at these places; the storage capacity of the elevators at the two ports being at present about forty million bushels.

Immigration from United States.—For many years, men left Canada to settle in the United States, but now farmers from the United States are entering Canada; this is probably due to three facts: (*a*) that the cheap lands of good quality in the Western States (U.S.A.) have now been occupied; (*b*) that the development of railroads in North-west Canada enables farmers to send wheat and other products to market at a moderate cost; (*c*) that accurate knowledge is now available with regard to the possibilities of the Canadian prairies. Most of the American immigrants enter Canada by the railway from St. Paul which joins the C.P.R. at Moose Jaw, about forty miles west of Regina.

West of **Moose Jaw** to **Medicine Hat** the grain belt gives way to a ranching country. All the way from Winnipeg the rainfall gradually decreases; Regina has sufficient moisture for heavy grain crops, but the risk of drought is greater than at Brandon or at Portage. At Moose Jaw, the semi-arid belt begins, and instead of wheat fields, grass-covered plains with few homesteads are seen; the grass grows to a height of two or three feet, and large numbers of cattle are pastured upon it. This area was once the home of the wild **buffalo**; they were hunted by the Indians for their meat and by white men for their skins. The last wild buffaloes were killed about 1885, but a few buffaloes are kept in captivity at Winnipeg, Wainwright, and at Banff. On the grasslands cattle, horses, and sheep have taken the place of the buffalo.

Medicine Hat is in Alberta on the South Saskatchewan; from this town a branch line runs to Macleod, while the main line continues to Calgary (3,380 ft. above sea-level). Near both **Macleod** and **Calgary** are lands reserved for Indians; cowboys and Indians are constantly seen in Calgary.

Throughout Southern Alberta bunch grass, which turns to hay without being cut, provides good pasturage. In winter the climate is dry and cold, but snow never lies deep on the ground. The warm Chinook winds afford some relief from the severity of the winter (see p. 22); these winds are felt most strongly south of Calgary, but they are experienced as far north as Red Deer and as far east as Moose Jaw. The rainfall of Southern Alberta is light and uncertain; hence irrigation is being carried over large areas near Macleod and Calgary. North of Calgary the rainfall increases, and so mixed farming, without irrigation, becomes possible.

Winnipeg to Edmonton.—Both the C.P.R., the C.N.R. and the G.T.P. have direct lines running from Winnipeg to Edmonton, the latter railway, moreover, has been continued across the Rocky Mountains to the Pacific coast, where **Prince Rupert** is the terminus.

The G.T.P. route from Winnipeg passes Portage la Prairie and reaches Melville, on a tributary of the River Qu'Appelle in Saskatchewan. From **Melville** a railway has been constructed to Port Nelson on Hudson Bay to provide a new outlet for the wheat-growing districts.

From Melville the railway passes westwards near the Touchwood Hills, a park-like country on which fine cattle are reared; beyond this the open prairie is crossed to Saskatoon on the South Saskatchewan. **Saskatoon** is surrounded on all sides by grain-raising lands; it is an important distributing centre for manufactured articles, and for duplicate parts of agricultural implements. Some Canadian manufacturers have already established branch works here and in other towns to supply the western farmers with what they require.

West of Biggar the **Tramping Lake** District is entered (150 miles from north to south and 40 from east to west), a level tract of country with scarcely a shrub to break the outlook; winter and spring wheat, flax, oats, and other crops are grown. At **Wainwright** is the famous buffalo park, a hundred thousand acres in extent.

Edmonton, the capital of Alberta, stands on the North Saskatchewan; it is about halfway between Winnipeg and Prince Rupert.

The geographical position of the town, the natural conditions of the surrounding district, and the construction of railways account for the rapid growth of the place. The

FIG. 21.—BREAKING UP NEW PRAIRIE LAND.
The five gasoline engines, shown in the picture, can plough more than 100 acres a day. (By courtesy of the C.P.R.)

people who live near Edmonton are engaged in agriculture (wheat, oats, barley, and other crops), in stock-raising, and in market gardening; the meat-packing industry has already been established in Edmonton.

From 1880 to 1900 **Alberta** was the greatest ranching country in America, but the days of the big herds are past. Horse rearing is a very profitable industry owing to the great numbers required for farm work and for city drays. At the present time, however, Alberta is pre-eminently an

agricultural province, possessing about one hundred million acres of arable land (not five per cent. of which is yet under cultivation).

The Northern Belt of the Prairie Provinces. — The latitude of Edmonton is 54½° N.; the position is therefore about halfway between the international boundary and lat. 60°, the northern boundary of the prairie provinces. If lat. 54½° be drawn across Manitoba, Saskatchewan, and Alberta it will be seen that nearly all the railways, settlements, and occupied lands lie south of that line (although in this southern belt vast tracts are still unoccupied); north of lat. 54½° there are practically no settlements, and the whole region is in a primitive state. This northern belt is traversed by a few hunters, trappers, and mining prospectors; the surface consists of grass, woodland, and water. In many parts the soil and climate are highly suitable for wheat cultivation, while the increased length of day during the summer months, when the wheat is ripening, would be an additional advantage to those in the southern belt. At the present time the great need of this region is men; emigrants are wanted to open up the country.

In northern Alberta is a vast district known as the **Peace River Country**, one of the richest sections of the North-West. Several railways (C.N.R., G.T.P., Edmonton and Dunvegan Railway) have now penetrated into the district and are opening it up to settlers.

EXERCISES.

1. Describe the importance of Winnipeg as a railway centre.

2. "Saskatchewan is now the greatest wheat-growing province of Canada." Give reasons for this.

3. "In the province of Alberta agriculture is now more important than cattle ranching." To what circumstances is this change due? Give some account of the two industries in this province.

4. State the position of Edmonton, Calgary, and Regina.

In the case of each city, state the climatic conditions and the occupations of the people.

5. By what routes is wheat exported from the Prairie Provinces? How is it that such large quantities can be exported? What do the farmers receive in return for their wheat?

6. Through what parts of the Prairie Provinces do the Transcontinental Railways run? How have these railways helped to develop the Prairie Provinces?

LESSON X.

BRITISH COLUMBIA AND YUKON.

1. Draw a large sketch map of the Fraser basin, and enter on it any facts mentioned in this lesson.

2. Trace the island of Vancouver on squared paper. Measure (1) its area, and (2) its greatest length.

3. Find the latitude and longitude of (*a*) Prince Rupert, (*b*) Vancouver. Measure the direct distance (in miles) between these ports.

British Columbia.—This province is very mountainous; the Rocky Mountains run in a north-westerly direction through the eastern part of the province, the highest peak being **Mt. Robson,** 13,800 ft. Between lat. 49° N. and lat. 54° N. the width of the range is about sixty miles, and many peaks reach a height of more than ten thousand feet; the higher slopes of the Rockies are covered with snow and glaciers. North of lat. 54° N. the ranges decrease in height and width. On the west side of the Rocky Mountains a deep valley runs parallel with the axis of the range; in this valley are the upper reaches of the Rivers Kootenay, Columbia, Fraser, Finlay, and others. These rivers cut their way westward through the mountains known as the **Selkirks** and **Cariboo.** The Gold range runs west of the Selkirks, and is separated from them by a valley in which are the River Columbia and the Arrow Lakes. Between these various ranges

and the Cascade Mountains on the Pacific seaboard are many extensive plateaux and deep valleys; some parts of the

FIG. 22.—THE EAST SIDE OF MT. ROBSON.
Note the glaciers above and below the gorge. (By courtesy of the C.P.R.)

plateaux are fairly level and suitable for agriculture and ranching, but other parts are dissected in all directions by rivers and streams.

The **Cascade** or **Coast range** extends along the Pacific seaboard; it is thickly forested, and the highest parts of it are snow-capped. The western edge of the Cascades forms the coast-line of British Columbia, and this coast-line is broken up into deep fjords (or drowned valleys) very similar to those of Norway. Vancouver Island, Queen Charlotte Islands, and others protect the channels between the islands and the mainland.

Climate.—The westerly winds from the Pacific bring abundant moisture and warmth to the coast lands of British Columbia. At some places on the coast the rainfall exceeds one hundred inches a year; in some of the valleys in the interior, however, the rainfall is so slight that irrigation is necessary for successful agriculture. On the mountains in the eastern part of the province the climate is cold and bleak and the snowfall is heavy.

People.—Until the middle of the nineteenth century British Columbia was inhabited by Indian tribes, and by employees of the Hudson Bay Company. In 1849 Vancouver Island became a Crown Colony, and a legislative assembly was elected in 1856. In the following year gold was discovered both on the island and on the mainland; a rush of gold-seekers took place, and in the summer of 1858 many thousands of men were searching for gold in the Fraser Valley. Mining for gold and silver is now an important industry in the West Kootenay district; coal is obtained near the Crow's Nest Pass (Rocky Mountains), and on the islands of Vancouver and Queen Charlotte.

The development of the mining industry attracted population and led to the union of Vancouver Island and the mainland under one Government, with the capital at Victoria. In 1871 British Columbia entered the Federation of the Dominion of Canada, and under the terms of the union the Canadian Pacific Railway was constructed to join this province to the eastern provinces of Canada. The C.P.R. was completed in 1886.

Communication.—(1) **Calgary to Vancouver.** From Calgary in Alberta to the lofty gap (4,200 ft. in height) by which the C.P.R. enters the Rockies, is about sixty miles. Near Banff, precipitous masses of grey limestone rise to a height of more than eight thousand feet, from which water pours down in rapids and cataracts. Banff, noted for its hot sulphur springs, is in the Canadian National Park, in

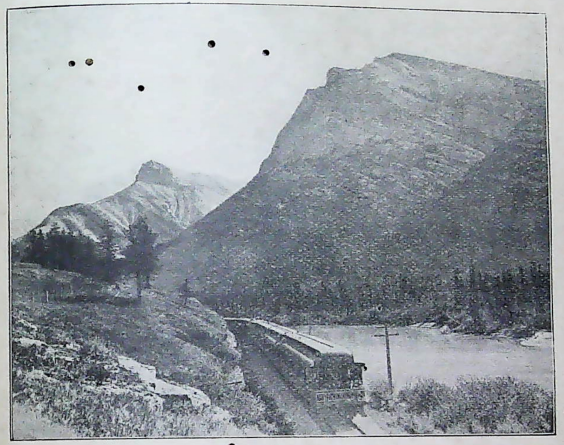


FIG. 23.—THE GAP, ALTA.
An entrance to the Rockies. (By courtesy of the C.P.R.)

which buffalo, moose, and elk are preserved. A little beyond Banff, glaciers can be seen to the northward from which streams flow to the Atlantic, Pacific, and Arctic Oceans.

Proceeding westward, the water-parting of the Rocky Mountains is crossed near **Kicking Horse Pass** (5,300 ft.). The line then descends a gorge by wonderful engineering feats of tunnels, bridges, etc., and reaches **Golden** on the River Columbia, which is here flowing almost due north.

FIG. 24.—MT. STEPHEN, BRITISH COLUMBIA.
Field, a station on the C.P.R., is seen in the foreground. (By courtesy of the C.P.R.)

Golden is a lumbering and a mining village, and from it steamers go up the Columbia to Kootenay, noted for copper, lead, and gold mining (Kootenay is also approached by

railway *via* Lethbridge and Macleod, Alberta, over the Crow's Nest Pass).

Crossing the Columbia below Golden, the railway ascends the narrow gorge of the **Beaver River** by steep gradients, passing iron bridges thrown over ravines of great depth. The railway originally crossed the watershed of the Selkirks

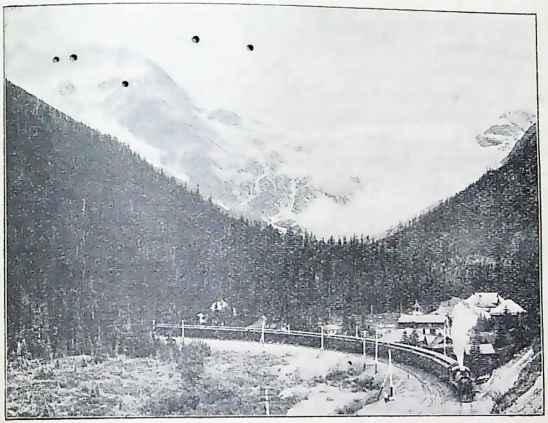


FIG. 25.—GLACIER.
A disused station on the C.P.R. in British Columbia (Selkirk Mountains). (By courtesy of the C.P.R.)

(Fig. 25) at Rogers Pass[1] (4,500 ft.), but it now passes through a tunnel more than five miles in length, thus avoiding the steep gradients over the pass.

At **Revelstoke** the Columbia is crossed once more, this time flowing south; and a few miles further west is Sicamous junction, from which a branch line runs forty-five miles due south through a broad valley to **Vernon**; in this valley are well-cultivated farms and large herds of cattle. The rainfall

[1] Rogers was a Government Surveyor who discovered the route.

is only about ten inches a year, hence irrigation is necessary; potatoes, oats, vegetables, and fruit are grown. Steamers navigate Lake Okanagan for seventy miles to **Penticton.**

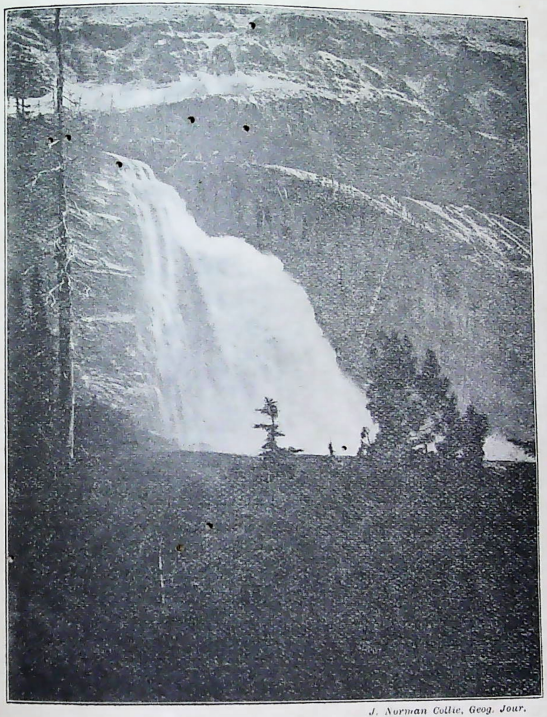
From **Sicamous** to **Lytton**, where the Rivers Thompson and Fraser unite, the railway passes through grazing and mining country; deciduous trees and conifers abound in this part of the route. For fifty miles the railway runs along the edge of a precipice beneath which the Fraser rushes with swift current in a narrow trough. In this part of its course are magnificent waterfalls such as the Grand Fork (Fig. 26). Towards Yale, the head of the tidal water, the river begins to spread out and the current to slacken. For the last dozen miles before Vancouver is reached the railway follows the winding shores of Burrard inlet.

Vancouver owes its origin to the C.P.R. It is situated on a long narrow tongue of land between Burrard inlet, which forms the harbour, and English Bay, a branch of the same channel; the town is surrounded by forests. Steamers start from this port for Japan, China, Hawaii, and Australia. Pacific steamers, subsidised by the Imperial and Dominion Governments, provide a regular service from Vancouver to Japan, the journey from Montreal to Yokohama taking less than eighteen days.

New Westminster is on the north bank of the Fraser River and ten miles from its mouth. There is considerable traffic up the Fraser and across Georgia Strait to Victoria. The chief industry at New Westminster is canning fish; large quantities of salmon are caught in the Fraser, and there are at least fifty canneries. Sturgeon, halibut, and other fish are placed in cold storage for export. Lumbering is also important, and there are many sawmills on Burrard inlet.

Many Chinamen get their living in British Columbia as domestic servants, farm labourers, or in the lumber camps; some are also employed in gold washing and in fishing. The Japanese, however, are now almost in complete control of the coast fisheries, of which the salmon fishing industry is the chief.

Vancouver Island.—Vancouver Island is about 280 miles long with an average width of about fifty miles. The



J. Norman Collie, Geog. Jour.

FIG. 26.—FALLS OF GRAND FORK, FRASER RIVER.

southern part is fairly level, well cleared and with many good roads; most people live in this part of the island. On the

east side is a strip of partially settled country which extends for seventy miles to **Nanaimo**, a coal-mining centre; fruit-growing is also an important industry. The chief railway in the island runs from Victoria *via* Nanaimo to Comox. The rest of Vancouver consists of mountains covered with forests, but many parts of the island are still unexplored. Minerals including gold, abound in the island.

Victoria, the capital of British Columbia, stands on a fine harbour; it is a port of call for Pacific liners. Four miles

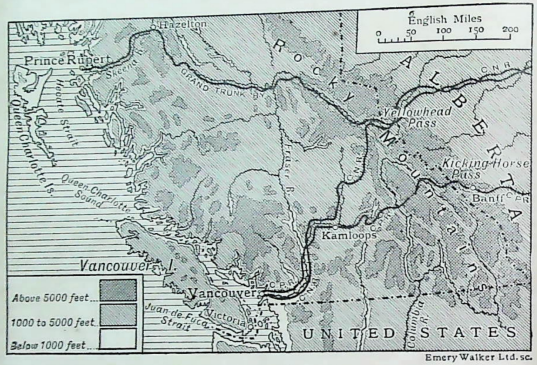


FIG. 27.—BRITISH COLUMBIA.
Showing the Railways which terminate at Vancouver and Prince Rupert.

from Victoria is **Esquimalt**, the naval station of the North Pacific squadron; it is a fortified place and is garrisoned by Canadian soldiers.

(2) **Edmonton to Prince Rupert.**—After leaving Edmonton in Alberta, the level, treeless plains give way to land covered with willows and other small trees which must be cleared before agriculture can be carried on. Passing **Edson**, near which are extensive coal deposits, the C.N.R. and G.T.P. cross the Yellowhead Pass into British Columbia; they skirt the foot of Mount Robson, the loftiest mountain in the Canadian

Rockies, and enter the valley of the Upper Fraser River. The C.N.R. then turns southwards to Kamloops and from there to Vancouver it parallels the C.P.R. The land round **Prince George** on the Fraser is suitable for mixed farming; it is proposed to construct a railway from this point to Vancouver. North of Fraser Lake the G.T.P.

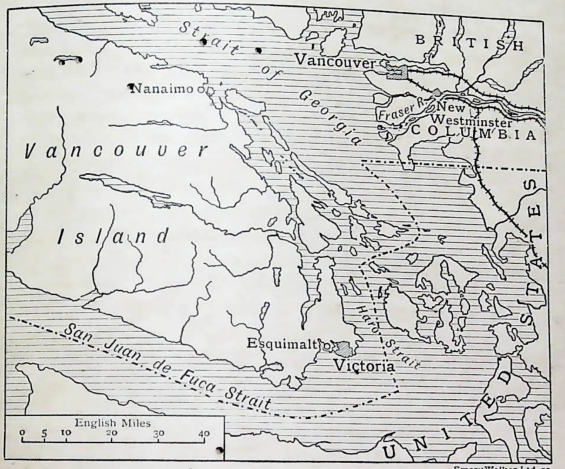


FIG. 28.—THE CHIEF WATER CHANNEL BETWEEN VANCOUVER AND THE MAINLAND.

traverses the fertile Bulkley Valley and reaches **Hazelton**, the head of navigation of the Skeena River. **Prince Rupert**, the terminus of the G.T.P., has many natural advantages, among which are: a fine harbour for Pacific liners, forests providing materials for lumbering and wood-pulp, minerals in the neighbouring mountains, salmon in the Skeena, and the halibut fishery off Queen Charlotte Islands.

The G.T.P. was completed in 1914. The main line from

Moncton in New Brunswick to Prince Rupert is 3,600 miles long. A service of steamers from Prince Rupert to Australian ports will probably be inaugurated at no distant date.

The North-West Territories.—These territories have been subject to severe glaciation, and many of the islands off the Arctic coast are covered with ice and snow at the present time. The River Mackenzie drains the waters of the Great Slave Lake and Great Bear Lake into the Arctic Ocean. In the southern parts of the Territories are coniferous forests; but in the north trees become stunted until mosses and lichens only are met with in the barren lands (or tundras) of the Arctic seaboard. Indian hunters trap the fur-bearing animals and bring the skins to the trading posts of the Hudson Bay Company and other fur-trading companies. Minerals of considerable value are obtained.

Yukon.—This is an elevated region drained chiefly by the upper reaches of the River Yukon and its tributaries. Mining is the principal occupation of the people. The discovery of gold in the Klondike valley in 1896 attracted men to the district. Coal and copper are also found. White and black spruce, poplar, and other trees grow in Yukon; and big game abounds, such as the moose, caribou, and bears.

Yukon was constituted a separate political area in 1898. **Dawson**, the capital, has only three thousand people; it is approached from Skagway *via* the White Pass, and from the American port of Dyea.

EXERCISES.

1. Write notes on: (*a*) the coast-line of British Columbia, (*b*) the Kootenay valley.
2. Describe the importance of the mining industry to British Columbia.
3. Give some account of fishing and agriculture in British Columbia.
4. State the position of the towns Vancouver and Prince Rupert. Compare these towns as regards commercial importance.
5. Write an account of Vancouver Island.
6. Compare Vancouver Island and Newfoundland as regards climatic conditions and industries.

PART II.

UNITED STATES

LESSON XI.

UNITED STATES: EXPANSION AND SIZE.

1. What percentage of the people of the United States are coloured?

Area of the United States, -	2,974,000 sq. miles.
White population, - - -	81,732,000
Coloured population, - -	9,828,000
Total population, - -	91,560,000

DISTRIBUTION OF POPULATION.

Most densely populated States.	Population per sq. ml.	Least densely populated States.	Population per sq. ml.
District of Columbia, -	5,518	Nevada, - - -	0·7
Rhode Island, - -	509	Wyoming, - -	1·5
Massachusetts, - -	419	Arizona, - - -	1·8
New Jersey, - - -	338	Montana, - -	2·6
Connecticut, - - -	231	New Mexico, - -	2·7
New York, - - -	192	Idaho, - - -	3·9
Pennsylvania, - -	171	Utah, - - -	4·5
Maryland, - - -	130	Oregon, - - -	7·0
Ohio, - - - -	117	South Dakota, -	7·6
Delaware, - - -	103	North Dakota, -	8·2
Illinois, - - -	101	Florida, - - -	13·7
		Texas, - - -	14·8
		California, - -	15·3
		Nebraska, - -	15·5
		Washington, - -	17·1

On a map of the United States indicate the most densely populated States with dark shading, the least populated States with light shading. Then mark the remaining States with cross shading.

2. The following cities of the United States have more than 200,000 inhabitants. Mark these cities on a map, and note in which part of the United States most of them are situated.

Cities.	Population 1000.	Cities.	Population 1000.
New York,	5,334	Washington,	353
Chicago,	2,393	Minneapolis,	343
Philadelphia,	1,658	Seattle,	313
St. Louis,	735	Jersey City,	294
Boston,	734	Kansas City,	282
Cleveland,	639	Portland (Oregon),	261
Baltimore,	580	Indianapolis,	259
Pittsburg,	565	Denver,	245
Detroit,	538	Providence,	245
Buffalo,	454	Rochester,	241
San Francisco,	449	St. Paul,	236
Los Angeles,	439	Louisville,	235
Milwaukee,	417	Columbus,	205
Cincinnatti,	402		
Newark,	389		
New Orleans,	361		

3. During the period 1910-14 the number of immigrants which entered the United States each year was 1,035,000.

Of these 89,000 came from the British Isles; 32,000 from Germany; 36,000 from Scandinavia and Denmark; 226,000 from Austria-Hungary; 221,000 from Italy; 211,000 from Russia; 9,000 from France.

What percentage of the immigrants came from the various countries? Draw a diagram to represent the facts.

The United States of America.—The great Republic of the United States owes its origin to the thirteen States on the

Atlantic seaboard which drew up the Declaration of Independence in 1776. By the Treaty of Versailles in 1783 the independence of the States was ackowledged by Great Britain, and at that time the term United States was understood to mean the territory which stretched from the Atlantic coast to the Mississippi. It is evident, therefore, that the history of the United States covers a period of less than one hundred and fifty years.

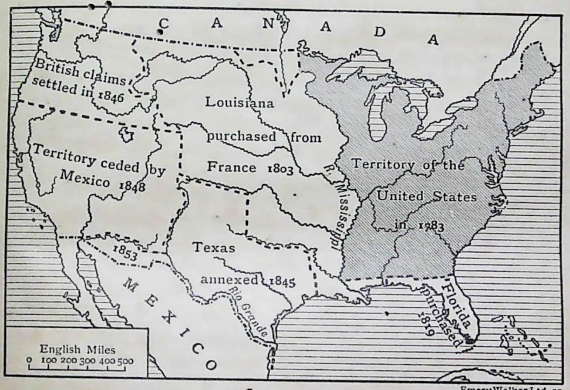


FIG. 29.—THE EXPANSION OF THE UNITED STATES.

Expansion.—The expansion of the United States to the Pacific was not completed until 1848; the various stages in this expansion are shown in Fig. 29. The claims of France, England, and Mexico to lands west of the Mississippi were of little value, as the territories were almost unexplored and contained few permanent settlements.

From the French settlement at the mouth of the Mississippi called Louisiana (founded 1697) French voyageurs had made expeditions up the river, and it became customary to speak of land west of the Mississippi as Louisiana,

although it was practically unknown and unoccupied by Europeans.

British claims to Oregon dated from the time of Drake; in his voyage round the world Drake landed somewhere on the coast, took possession of the land under the name of New Albion and then sailed away. Drake left no settlers, and no British colony was established there.

The mission stations of San Diego, San Francisco, and many others for the conversion of the natives were established along the Pacific coast by Spanish priests from Mexico in the seventeenth century.

Size of the United States.—The area of the United States comprises nearly three million square miles, an area about equal to that of Australia. One State (Texas) has an area of more than twice that of the British Isles.

The great size of the United States may be illustrated by the following facts:

(*a*) **Time Belts.**—When it is noon at Boston (71° W.) the time by the sun at San Francisco (122½° W.) would be about 8.30 a.m. This difference in time, due to the great width from east to west, made it necessary to divide the United States into Time Belts (Fig. 30). Within each belt all clocks show the same time, but in passing from one belt to another in a westerly direction the time by the clock must be put back an hour. In Great Britain all clocks are set to Greenwich time; hence clocks at Penzance are set to the same time as those at Yarmouth or Aberdeen.

(*b*) **Distances.**—The distance from New York to San Francisco by transcontinental railway is 3,270 miles (a distance five and a half times as great as the direct distance from Land's End to John o' Groats). The journey takes five to six days. If a train travelled the whole distance at fifty miles an hour without stopping the journey would even then take nearly three days and three nights.

From the Canadian frontier to the Gulf of Mexico, the distance, if measured along meridian 90° W., is about one thousand four hundred miles.

Growth of the United States.—The rapid development of the United States as regards wealth and power was one of the wonderful features of the nineteenth century. Before the end of that century the United States had become (*a*) one of the leading political States in the world, (*b*) the greatest coal and iron producing country of the world, (*c*) and the rival of Great Britain and Germany for the first place in the commercial and industrial world. To so great an

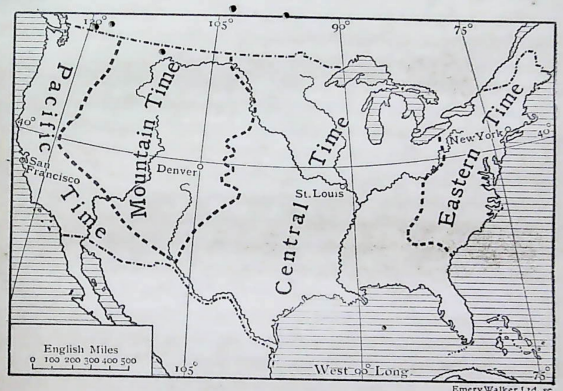


FIG. 30.—THE TIME BELTS OF THE UNITED STATES.

extent did the United States dominate the affairs of the New World in the nineteenth century that people even now use the words America and American when referring to the United States only, *e.g.* a man starting from England for New York says he is going to America, but if going to Montreal or Toronto he says he is going to Canada (not America).

The oldest States were on the Atlantic seaboard, and after 1783 these States continued to grow in importance because of their natural resources, their position with regard to European commerce, and the productive lands to the west.

From the table (pp. 73-4) it will be seen that the most densely populated States are in the east and nearly all the largest cities also are in the east. **New York**, the only city which can compare with London in population, is the commercial capital, and its enormous trade developed during the second half of the nineteenth century. The political capital, **Washington**, is also in the east. It was chosen in 1800, that is, before the great expansion west of the Mississippi took place; but even if it were decided to choose a new capital now, the distribution of population at the present time would certainly require the seat of government to be east of the Mississippi and not west of it.

Unity of the United States.—The expansion of the United States to the Pacific resulted in the union under one government of many regions totally different from each other, *e.g.* the manufacturing districts of New England, the agricultural lands of the prairies, the cattle ranches of the great plains, the cotton States of the south, the mining areas of the west, the forest region of Washington and Oregon and many others. These various regions were held together very loosely at first; the interests of the inhabitants of the Western States seemed to have little in common with those of the Eastern States, while the proposal to abolish slavery brought the Southern States into open hostility with the Northern States. The latter question was settled in the war between the North and South, 1860-5; the former was settled very largely by the construction of railways.

When gold mining became important in California in 1850-60, so isolated was California from the Eastern States, and so dangerous was it to travel across the continent by mule tracks, that the gold was actually sent by sea from California to the isthmus of Panama, across which it was carried by railway to Colon and thence shipped to New York. The opening of transcontinental railways changed this method of transport, and the Rocky Mountains soon ceased to be a barrier to communication from one side of the continent to the other, and consequently the Western

States have been brought into closer touch with the Eastern States.

Frontiers.—(*a*) **Atlantic Coast.** Separated from Europe by the Atlantic Ocean, the United States Government has always refrained (until 1917) from interfering in European politics and from making European alliances. The outlook to the east has, however, given the United States great opportunities as regards trade with the Old World, and full advantage has been taken of these by the enterprising merchants of New York, Philadelphia, and other Atlantic ports. Most of the immigrants from Europe enter the United States by these ports.

(*b*) **Pacific Coast.**—The outlook to the west has given opportunities for trade with Japan, China, New Zealand, and Australia. San Francisco is the most important port on this coast, but the commerce of San Francisco does not rank in importance with that of New York.

Many Japanese and Chinese have settled in the cities and on the coast lands of the Pacific.

It should be noted that Hawaii (Sandwich Islands), now a possession of the United States, is a convenient calling-place for ships crossing the Pacific.

(*c*) **Canadian Frontier.**—The international frontier on the north runs from the Pacific coast along latitude 49° N., through Lakes Superior, Huron, Erie, and Ontario, and then south of the St. Lawrence estuary to the Bay of Fundy. With the exception of a few gunboats on the Great Lakes this frontier is wholly undefended.

Railways cross this frontier at many points, and communication between Canada and the United States has grown rapidly during the last twenty-five years. Many men who first settled in the United States have afterwards crossed the frontier and taken up lands in Canada.

(*d*) **Mexican Frontier.**—This frontier follows the course of the Rio Grande del Norte and then proceeds to the north-west, passing a little to the north of the Gulf of California. Political unrest and frequent revolutions in Mexico have

resulted in troubles on this frontier. Bands of Mexican freebooters have raided United States territory from time to time, and punitive expeditions have been sent across the frontier into Mexico.

EXERCISES.

1. Say what you know of the distribution of population of the United States.
2. Of what political importance was the construction of railways to the United States?
3. What is meant by a Time Belt?
4. Describe the land frontiers of the United States.
5. Name the two largest cities on the Pacific side of the United States. Give the position of each.

LESSON XII.

GROWTH OF COMMUNICATION ROUTES.

1. Find on an atlas the positions of the following: Boston, New York, Philadelphia, Baltimore, Buffalo, Montreal, Pittsburg. Draw a sketch map and mark the positions of these towns; draw the rivers and shade the highlands. Enter on the map (*a*) the roads and canals mentioned in this lesson (pp. 80-86); (*b*) the railways (in red ink) with the date of opening.

2. Measure the following railway distances:
   (*a*) New York to Buffalo.
   (*b*) Boston to Buffalo.
   (*c*) Philadelphia to Pittsburg.

3. On an outline map of North America mark (in black ink) the railways which connected the Atlantic ports with the Mississippi valley in 1863, and mark (in red ink) the railways which now extend to the Pacific ports.

Means of Communication.—Until the end of the War of Independence in 1783, the English-speaking settlers in North America were confined almost entirely to the Atlantic seaboard. In Fig. 29 the territories of the United States in 1783 are shown, and the expansion of these territories to the Pacific can be traced from the map. In this movement to the west, means of communication were of the utmost importance to the newly acquired lands.

At the present day many of the great routes for traffic follow the lines of the old **Indian trails**. White men became acquainted with these trails in the early days of settlement,

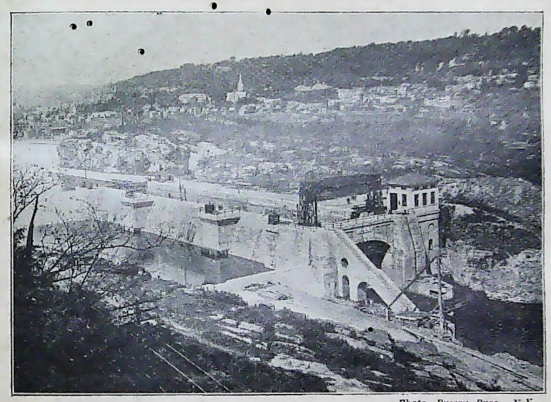


Photo. Brown Bros., N.Y.

FIG. 31.—ERIE CANAL.—ONE OF THE LOCKS.

and the tracks were frequently widened so that they could be used by **pack-horses**; later, trees were cut away on both sides of the track and stones were taken out in order to provide a road that could be traversed by waggons and other wheeled vehicles.

Rivers were also used for transport. Where a stream was obstructed by falls, rapids, or shallows, goods were taken from the boats and carried past the obstruction to navigable water; these carrying places were called **portages**.

Hudson-Mohawk.—Indian and white traders were constantly passing up and down the Hudson-Mohawk valley because of the trade in furs. There were many carrying places in the course of the journey, such as the waterfall at **Cohoes** and at **Rome**, where the low divide between the Mohawk and Wood Creek had to be crossed.

In 1796 the State authorities constructed a great road, a hundred miles long, from Utica to Geneva (on Seneca Lake)

Photo. Underwood & Underwood, N.Y.

FIG. 32.—BROOKLYN SUSPENSION BRIDGE.

for the use of waggons and stage-coaches; this was known as the **Genesee road.** Some years later (1825) the **Erie Canal** was opened for navigation, and it connected the navigable waters of the Mohawk with Lake Erie, having a branch to Lake Ontario. By this canal goods could be carried from **Buffalo** to **New York**, and consequently products from the west, such as wheat, had an outlet to the Atlantic coast.

By this method of transport the cost of carriage was greatly reduced; goods were sent right through to the coast without being handled on the way. The opening of the Erie

Canal had an important effect on the trade of New York, since ships from Europe could obtain return cargoes. At that time Boston and Philadelphia had only waggon roads to the west, and road traffic could not compete with water transport.

Railways.—One of the first railways in the United States was made from Albany to Schenectady (18 miles long); this railway was soon extended, and in 1831 it was opened for traffic from New York to Buffalo, a distance of four hundred and fifty miles. This railway, the New York Central, very closely followed the Canal route; there were no difficult gradients, no expensive cuttings or tunnels, while the highest point on the line was 445 feet (at Rome). A rival line, along the west side of the Hudson, has been incorporated with the first railway. These railways greatly reduced the canal freights, and the traffic to New York was considerably increased.

New York.—New York City is situated on Manhattan Island at the mouth of the Hudson; on both sides of the island there is deep water for shipping. Lower Bay, Raritan Bay, and Sandy Hook Bay are suitable for the largest liners. Coasting trade with New England is carried on through Long Island Sound. The trade of the Atlantic coast tends to centre at New York. This fact is due to (*a*) good harbour accommodation; (*b*) easy access to the great lakes and the lands of the west by way of the Hudson-Mohawk valley; (*c*) the great development of railways.

Boston.—In the New England States, the mountain ridges such as the Berkshire Mountains, Hoosac Mountains, and others, run from north to south, and so they present a series of obstacles to communication from Boston to the west. Some of the Indian trails across the mountains and valleys were made into roads, but it was very difficult to make good waggon roads from the Connecticut valley to the Hudson valley. In 1825 (the year in which the Erie Canal was opened) a road was completed from **Springfield** on the Connecticut along the Westfield valley to **Albany** on the Hudson. Goods from the west came to Albany, but few of them went

along the road to Boston, as in most cases they were carried down the Hudson valley to New York. Road transport cannot compete successfully with water carriage, and it

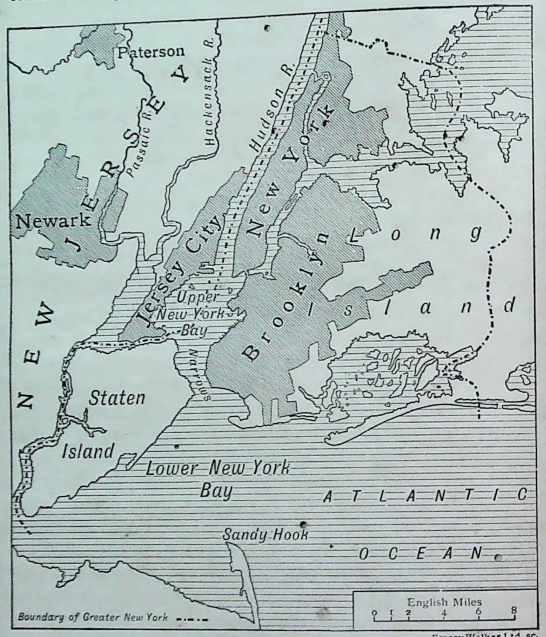


FIG. 33.—NEW YORK.
The broken line shows the extent of Greater New York.

was impossible to make a canal across the mountains to Boston.

Railway construction was also difficult, as the necessary gradients were very steep. Not until the completion of the

Hoosac tunnel in 1873 did Boston obtain a satisfactory route to the west; since that time Boston has had a share of the western trade, and it now ranks as a port second only to New York.

Philadelphia.—One of the first turnpike roads in the United States was made along the track of an Indian trail from Philadelphia to Lancaster (66 miles), and it was soon extended across the rich fertile lands of the Susquehanna valley to Chambersburg and then on to Bedford. In 1758 this road was continued through the woods and over the highlands to Pittsburg, and it became known as the **Pittsburg Pike**. During the war with the French and afterwards in the War of Independence, this road was of considerable military importance.

The opening of the Erie Canal made the people of Philadelphia anxious to have a canal to **Pittsburg**, and so in 1826 a canal was made to **Harrisburg** on the Susquehanna, and it was then continued along the valley of the River Juniata to **Hollidaysburg**, where it was stopped by the mountains. A canal was also made from Pittsburg to **Johnstown** on the west side of the ridge. Over the ridge between Hollidaysburg to Johnstown a road was constructed; cars were hauled up the slope by stationary engines, and on the level parts horses were used, while two hundred feet from the top a tunnel was made. This route was opened for traffic in 1835, but it could not compete with the through water route from Buffalo to New York *via* the Hudson-Mohawk.

About twenty years later the **Pennsylvania Railway** was completed from Philadelphia to Pittsburg *via* Altoona; the highest point on the railway was 2,160 feet, and there were several steep gradients. The route of the railway followed very closely that of the canal and road route. This railway has since been extended to New Jersey, and by means of a tunnel under the Hudson it has gained an entrance into New York.

Baltimore.—Baltimore is situated near the head of Chesapeake Bay about one hundred and fifty miles from the open

sea. From Baltimore to the west the easiest route runs up the Potomac valley. A canal was begun to connect this valley with the Ohio, but it was never finished. In 1818 a great road, built by order of the United States Government, was opened from **Cumberland** over the mountains to **Brownsville** on the Monongahela, and then over some low hills to Wheeling on the Ohio. This route was known as the **National Road.**

In 1853 the Baltimore and Ohio railroad was completed and it connected Baltimore with Pittsburgh *via* Cumberland, the highest point on the route being 2,620 feet.

Summary.—From the beginning of the nineteenth century many attempts were made to provide highways to the west from Atlantic ports. The routes from New York and Boston led to Buffalo, and through this town much of the lake traffic passed. The routes from Philadelphia and Baltimore focussed on **Pittsburgh** (the gateway of the west). If these routes had not been opened up, much of the lake traffic would have passed to the St. Lawrence valley and that of Pittsburgh down the Ohio and Mississippi to New Orleans. As it was, this traffic was largely diverted to the Atlantic ports, and New York gained the greatest share of it because it commanded the easiest route both for canal and railway transport.

Down to the year 1863 railways in North America were almost entirely confined to the region between the Atlantic and the Mississippi. The present network of railways in the Eastern States, and the extension of railways to the Pacific coast, all belong to the last fifty or sixty years. The first **Transcontinental railway** with its western terminus at San Francisco, was completed in 1866. The railways which reach the Pacific coast of the United States chiefly focus (1) at **San Francisco,** which stands on the best harbour for trade, and (2) at **Portland** and **Seattle.**

EXERCISES.

1. State the position of Boston, New York, and Philadelphia respectively. In what circumstances did New York become an outlet for the products of the west before either Boston or Philadelphia ?

2. Describe the Erie Canal, and draw a sketch map to show the route.

3. Before railways became so important, why were goods for export sent from Buffalo to New York rather than from Buffalo to Montreal ?

4. Say what you know of the following in connection with travelling in North America before the time of railways : trails, portages, canoes, roads.

5. Why was Pittsburgh called "the Gateway of the West"? What means of communication does Pittsburgh possess at the present time ?

6. Examine a railway map of the United States and say what you notice about the Appalachian Mountains, Rocky Mountains and Mississippi respectively in relation to the railways.

LESSON XIII.

CLIMATE OF THE UNITED STATES.

1. On a map of the United States mark the areas which have (*a*) the greatest, (*b*) the least annual rainfall. Mark with arrows the direction of the prevailing winds.

2. Draw a sketch map of the United States. Mark the most important natural regions ; on each region insert any facts with regard to vegetation.

Climate.—The conditions of climate in the United States are determined mainly by the following factors :

(1) The position of the United States in the North Temperate Zone between latitude 30° N. and 49° N.

(2) The prevalence of westerly winds between 30° N. and 60° N.

These factors are modified very greatly by the relief of the land and by distance from the ocean.

Relief.—On looking at a physical map of the United States it will be noticed (*a*) that east of longitude 100° the land is either low lying or of moderate elevation, and (*b*) that west of longitude 100° mountain ranges and plateaux extend to the Pacific.

The only mountains in the eastern part of the United States are the **Appalachian Highlands**, which reach a height of 6,000–7,000 feet. These Highlands are flanked on the east

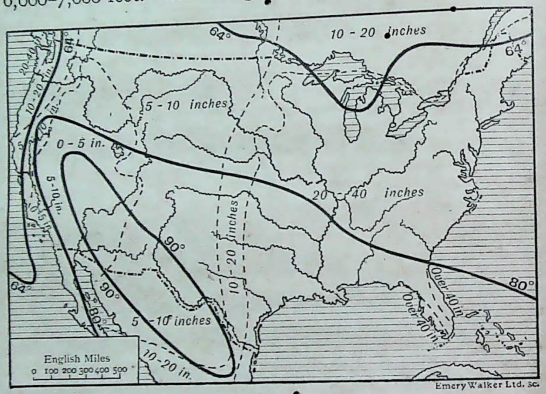


FIG. 34.—SUMMER CLIMATE.
Showing July Isotherms and Rainfall May to October.

by the Atlantic coast plain, on the south by the Gulf Plain, and on the west by the Mississippi plain. West of longitude 100° the whole country is elevated. The **Rocky Mountains** stretch from the border of Mexico in a north-westerly direction across the Canadian frontier; the Rocky Mountains are furthest from the Pacific Ocean in the neighbourhood of latitude 40°, the distance along that line being about a thousand miles. West of the Rocky Mountains are plateaux and basins bounded on the west by the **Cascade Mountains** and the **Sierra Nevada.** Along the Pacific seaboard extends

the Coast range, broken only by the Golden Gate, the mouth of the Columbia, and by Puget Sound.

Temperature.—It should be noted that in summer the air over the land becomes much hotter than the air over the ocean; and in winter the air over the land becomes much colder than air over the ocean. The moderating influence of the Pacific Ocean is shown on Fig. 34 by isotherm 64° which in July runs close to the western coast; this moderating influence

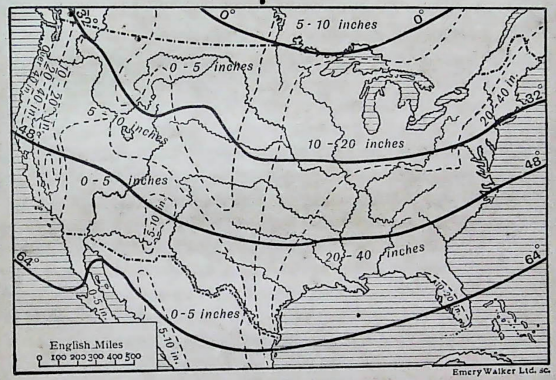


FIG. 35.—WINTER CLIMATE.
Showing January Isotherms and Rainfall November to April.

does not extend far inland on account of the mountain ranges near the coast, hence the temperature soon rises to 80°. The over-heated areas within isotherm 90° are a result of continental conditions, since the region is shut off from oceanic influences. The Gulf of California is somewhat similar to the Red Sea as regards high temperatures and desert surroundings.

The **Great Lakes**, the **Gulf of Mexico**, and the **Atlantic Ocean** tend to modify the temperatures in the eastern half of the country; hence isotherm 80° bends to the south-east, and

isotherm 64° has a southward dip as it crosses the Great Lakes and again when it approaches the Atlantic Ocean. The January isotherms (Fig. 35) as a rule bend southwards as they cross the United States, showing that the temperatures over the land are lower than those over the ocean. The moderating influence of the Pacific in January is shown by the direction of isotherm 32° as it approaches the west coast. North of isotherm 32° the average temperatures for January are below freezing point.

Winds and Rainfall.—Over the surface of the Pacific Ocean **westerly winds** blow almost uninterruptedly between latitudes 30° and 60°, and they bring abundant rain to the western coast. On the coasts of Washington and Oregon the westerlies bring rain at all seasons of the year, but especially in the autumn and winter. In summer the belt of westerly winds moves north, and California being a sub-tropical region, comes under the influence of the North-East **Trade Winds**; hence, the Californian summer is hot and rainless. In winter, however, the wind belts move south, and California then becomes associated with the westerly winds; hence rain in California falls chiefly in the winter (cf. the winter rains of the Mediterranean region).

As the westerlies pass over the Pacific coast ranges, the descending currents of air on the eastern slopes are dry, and the basins and plateaux are left in an arid condition; some vapour is, however, carried across these regions to the Rocky Mountains, where it falls as rain on the higher slopes of this range.

In winter, the westerlies are also felt in the Gulf of Mexico and on the coasts of Florida.

In the Mississippi valley there are southerly inflowing winds in summer and in winter northerly outflowing winds; these winds are caused chiefly by the difference in temperature between land and water. In this region, as well as in the Southern States, rain falls chiefly in the summer months; the heaviest rainfall being on the Southern Appalachians.

In the New England States cold northerly winds blow in winter, and they are often felt as far south as New York; they are sometimes accompanied by driving snowstorms called **blizzards**.

Cyclones.—On the open plains east of the Rocky Mountains the development of low-pressure areas frequently give rise to cyclones. In summer, the various changes in the weather are due in most cases to cyclones. On the approach of a low-pressure centre, hot southerly winds begin to blow, and

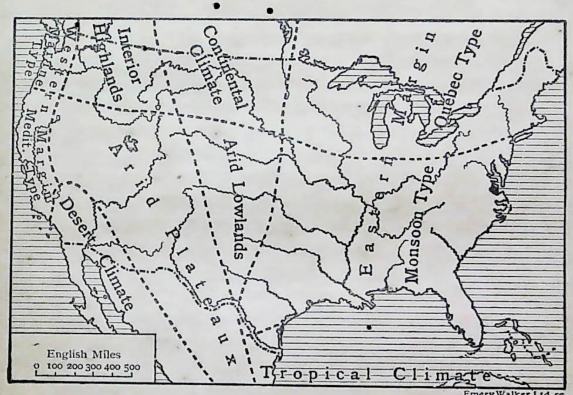


FIG. 36.—NATURAL REGIONS OF THE UNITED STATES.

they often blight the crops; occasionally the cyclone becomes a whirling **tornado** which destroys everything in its path.

In winter, cyclones are more frequent and more intense. As a rule, all cyclones which thus develop on the plains sweep across the country towards the New England States and pass on towards the Atlantic.

Natural Regions.—The United States may therefore be divided into the following natural regions:

(1) The **North East Region.**—The climate of this region belongs to the Quebec type (Fig. 36).

(2) The **South East Region** (China type).—The chief features of this region are: hot summers with abundant rain and cool winters; the crops are of cotton, rice, maize, tobacco, and fruits.

(3) **Arid Lowlands** (the Great Plains between long. 97° and the Rocky Mountains).—This region is remote from the sea, hence its extreme climate and scanty rainfall; its grasslands are used for stock raising, and no crops can be raised without irrigation.

(4) **Arid Plateaux** (between the Rocky Mountains and the Sierra Nevada and Cascade Mountains).—The chief features are: great range of temperature, very slight rainfall, and large tracts impregnated with salt. Coarse shrubs and sage bush are the only natural vegetation; a few fertile districts due to irrigation from the mountain streams.

(5) **Desert Climate** (a region somewhat similar to the Sahara, but small in area because North America narrows near the Tropic).—This region is almost rainless, with very high temperatures in summer; alkaline plains with scanty vegetation of cactus and other drought-resisting plants; the date palm will grow where there is water.

(6) **The Mediterranean Type** (California).—The chief features are: hot summers, warm winters; most rain falls in winter. Wine, oranges, and other fruits are largely grown.

(7) **The Marine Type** (Washington and Oregon).—In this region the range of temperature is small; rain falls throughout the year, but especially in autumn and winter. Cereals, apples, pears grow in abundance; trees also grow on the mountain slopes.

EXERCISES.

1. What parts of the United States are noted for (*a*) summer rains, (*b*) winter rains? Explain why rain falls at these seasons in the particular districts.

2. Describe the climatic conditions in the Mississippi Basin (*a*) in summer, (*b*) in winter.

3. Contrast the climatic conditions on the Pacific coast of the United States with those on the Atlantic coast.

4. Why are the lands on both sides of the Rocky Mountains deficient in rain?

5. Explain the terms cyclone, blizzard, and tornado, with special reference to the United States.

6. "New York and Salt Lake City are situated on lat. 41° N." Account for the difference of climate at these places.

7. In what respects does the climate of New Orleans differ from that at Minneapolis?

8. How do cyclones affect the weather conditions of the United States?

9. In what ways do some parts of Arizona resemble the Sahara desert?

10. Compare the temperature and rainfall at St. Paul with that at New Orleans.

How do you account for the difference in rainfall at the two places?

Why is the average temperature at New Orleans higher than that at St. Paul?

TEMPERATURE AND RAINFALL.

	St. Paul.		New Orleans.	
		Inches.		Inches.
January,	12·3° F.	0·8	52·8° F	4·5
February,	15·1	0·8	55·7	4·4
March,	28·2	1·5	62·1	5·4
April,	46·3	2·4	67·7	4·7
May,	57·8	3·6	73·8	3·8
June,	66·7	4·3	80·1	6·1
July,	72·1	3·4	80·7	6·4
August,	70·2	3·6	81·2	5·7
September,	60·5	3·5	77·8	4·8
October,	47·9	2·5	69·7	2·9
November,	30·8	1·4	60·6	3·7
December,	19·2	1·0	54·3	4·4

11. Draw a diagram similar to Fig. 11 to show the conditions of temperature and rainfall at St. Paul and New Orleans respectively.

LESSON XIV.

THE GLACIATED REGION OF NORTH AMERICA.

1. Draw an enlarged map of the River Niagara and the Welland Canal.

2. On a map of North America enter the chief facts mentioned in this lesson (pp. 94-99).
Shade that part of North America which was once covered with ice.

3. Draw a diagram to show the different kinds of moraines.

The Ice Cap.—At the present time there are great glaciers on the mountains of Switzerland and of Scandinavia, while Greenland is almost covered by an ice cap more than a thousand feet thick. The work done by the masses of ice in these countries can be studied and the results of the ice movements, such as morainic deposits, polished rocks, and others, can be clearly seen. All these evidences of glaciation are found in that part of North America which lies north of the line shown on Fig. 37, although perpetual ice only now exists in the far north and on the highest mountains. Without doubt, therefore, a cap of ice hundreds of feet thick once extended over the vast area shown on the map. From the region round Hudson Bay the ice moved in a south-easterly direction over New England, in a southerly direction over the middle and western States, in a westerly direction nearly to the Rocky Mountains, and in a northerly direction towards Alaska and the Arctic Ocean.

The Results of Glaciation.—A change in the climate of North America caused the ice to melt gradually, and the melting took place most rapidly along the southern edge of the ice cap. Consequently the face of the ice cap tended to recede further and further to the north, and the rocks

beneath the ice were left exposed to view; in some places the ice may have advanced again for a time and then receded once more. Where the older rocks were laid bare (as in Labrador) the surfaces appeared to have been polished and in some cases scratched by the glaciers which once covered them.

During the glacial period many pebbles and boulders must have been carried by the glaciers to regions where the

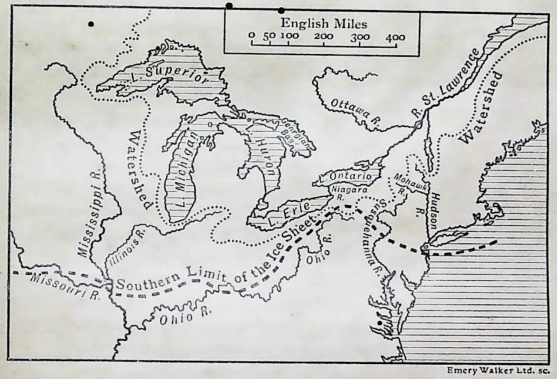


FIG. 37.—The broken line shows the southern limit of the Ice Sheet. The dotted line shows the Watershed between the rivers flowing to the Mississippi and those flowing to the Great Lakes and St. Lawrence.

rock formation was quite different from that of the boulders. Such masses of rock are called **erratics**, and many of them now in the United States must originally have come from the Laurentian Highlands.

Terminal moraines, or ridges of rock, left by the retreating glaciers, form many of the low hill ranges which now separate the river valleys.

Very large areas of this glaciated region were, however, left buried beneath a covering of **glacial drift** consisting largely

of clay with pebbles in it; deposits of sand and gravel are also found. The thickness of this drift-sheet varies from a few feet to several hundred feet. On these clay soils wheat is now extensively grown in the United States and in Canada.

FIG. 38.—DIAGRAM TO SHOW THE MEETING OF TWO GLACIERS.
B, lateral moraines; C, medial moraines; D, terminal moraines.

Valleys and rock basins must have existed in North America before the glacial period; during that period they were filled with ice, and the movement of the ice tended to deepen and to widen them. After the ice had melted, lakes were formed in many of these valleys as the outlets were blocked up by deposits. The **Finger Lakes** (Seneca, Cayuga, and others) in New York State were formed in this way. **Lake Superior** lies in an old basin, and the rocks along the shores of the lakes and on the islands in the lake show signs of glaciation. The four lakes, **Michigan, Huron, Erie,** and **Ontario** probably occupy old river valleys which were deepened and widened by the ice-sheet.

History of the Great Lakes.—The history of the development of the Great Lakes from the glacial period to the present time may be considered in four stages.

(1) **Mississippi Drainage.**—As the ice receded northwards from the position shown on Fig. 37, moraines were left which now form the watershed between the streams flowing into the Great Lakes and those flowing into the Mississippi and Susquehanna. This **watershed** is shown on Fig. 37. It will be noticed that the glacial ice at its greatest extension came south of the position of this watershed. As the ice melted,

it gradually receded north of the divide, hence lakes were formed, the waters of which were held up by the height of land on the south and the glacial ice on the north. The level of the water in these lakes rose to the height of the divide and then flowed over it in a southerly direction. From the partially formed Lake Superior the overflow entered the Mississippi; from Michigan it entered the Illinois; from Erie it entered the Ohio, and from Ontario the Seneca and Susquehanna flowed. At this stage no drainage to the east was possible, as the ice cap filled the valleys of the St. Lawrence, Mohawk, and other streams.

(2) **Mohawk-Hudson Drainage.**—At a later period the receding ice left the Mohawk valley open, and the overflow from the lakes reached the Atlantic through the Mohawk-Hudson valley. In consequence of this change the overflow from Lake Erie began to flow towards Lake Ontario, and so the Niagara River and Cataract were formed. Most of the water from the upper lakes, however, drained from Georgian Bay directly into Ontario. The volume of water in the Niagara River must have been small, while that in the Mohawk must have been enormous.

(3) **St. Lawrence Drainage.**—At length the St. Lawrence valley became free from ice, and the overflow from the upper lakes passed mainly through the Ottawa valley into the St. Lawrence, and the Mohawk was abandoned as the main outlet from the lakes. The River Niagara still carried off the overflow from Lake Erie, but it remained a small river.

(4) **Tilting of the Land.**—Since the close of the glacial period the last great change in this region began to take place, viz. a tilting of the land. In consequence of some earth movement, the eastern part of the region was slowly raised towards the north and east, and most of the plain that holds the lakes began to slant slightly towards the south-west. This tilting is shown by shore-lines, or beaches which were originally in horizontal positions and are now no longer level, *e.g.* at the southern end of Lake Huron, there is

a shore-line twenty-five feet above the lake; at the northern end it is 635 feet above the lake. This tilting is still going on very slowly, and the rate of movement has been calculated to be about five inches to one hundred miles in a century.

With regard to the drainage, this uplift prevented the waters of the upper lakes from flowing into the Ottawa valley, hence the overflow passed from Lake Huron into

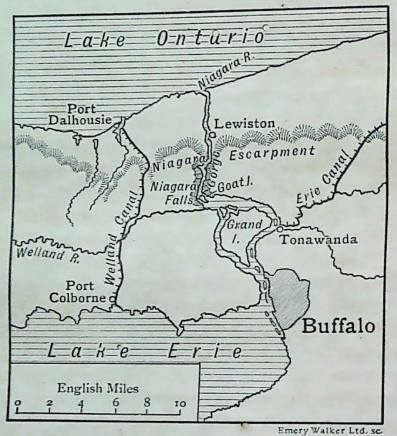


FIG. 39.—NIAGARA RIVER AND WELLAND CANAL.

Lake Erie by the River St. Clair. The volume of water in the River Niagara consequently became very great, and the present drainage system of the five great lakes into the St. Lawrence was arrived at.

The Niagara Falls.—From Lake Erie the River Niagara flows between low banks and with moderate current for the first thirteen miles, and in this part of its course it encircles Grand Island. The reunited waters then flow swiftly in a series of rapids and, divided by Goat Island, they plunge

over a cliff 160 feet high in two falls known as the **Horseshoe Fall** and the **American Fall**. Below the Falls the waters rush for seven miles through a gorge, and finally they cross the low-lying lands near Lake Ontario.

When the Niagara River first flowed from Lake Erie into Lake Ontario it fell over the escarpment near Lewiston (Fig. 39). The Falls are now seven miles south of this escarpment; the Niagara has therefore gradually cut its way back, and has thus formed a gorge nearly two hundred feet deep. The formations on the sides of the gorge are exactly similar in structure.

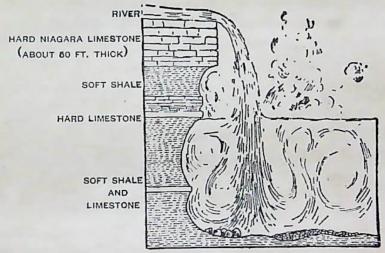


FIG. 40.—SECTION OF NIAGARA FALLS.

In Fig. 40 it will be noticed that the water falls over a projecting mass of rock, and the lower face of the cliff has been worn away. This is due to the varying composition of the strata. At the top is the hard Niagara limestone about fifty feet thick: below, a series of soft shales. The soft formations wear away, and the overhanging limestone then falls by its own weight. In the Horseshoe Fall the force of water is so great that the fallen blocks are carried onwards; the American Fall is not powerful enough to do this, and so the broken limestone is piled up at the foot of the cliff. Had the soft formations been on the top there would have been no Niagara Falls, but, instead, a series of rapids between Erie and Ontario.

EXERCISES.

1. Describe the Niagara River with reference to (*a*) the rapids, (*b*) the falls, (*c*) the gorge.

2. Describe Fig. 40; what would have happened to the Niagara River if the hard limestone had been underneath the softer rocks instead of on the top of them?

3. Explain what is meant by the following: moraines, erratics, glacial drift.

4. State the evidences which show that a large part of North America was once covered with ice.

5. Briefly describe the various changes which have resulted in the present drainage of the Great Lakes.

LESSON XV.

THE GREAT LAKES.

1. From the measurements in the subjoined table draw a diagram (similar to Fig. 42) showing the waterway from Duluth to the Atlantic. Use a vertical scale of 1 inch to 1000 ft.; horizontal scale, 1 inch to 100 miles.

Lake.	Length.	Elevation	Depth.
	Miles.	Feet.	Feet.
Superior, - -	410	600	1,000
Michigan, - -	335	580	870
Huron, - -	263	580	730
Erie, - - -	240	570	210
Ontario, - -	190	247	740

River St. Clair, 60 miles long; River Niagara 36 miles.
Height of Niagara Falls, 160 ft.
From Lake Ontario to the ocean, the St. Lawrence flows 750 miles.

Detroit Photographic Co. Photogravure Co.

FIG. 41.—NIAGARA FALLS.

2. From a large-scale map trace the five great lakes on transparent squared paper. Count the squares in order to find the area of each lake.

3. Draw a sketch map of the Great Lakes, and mark the course of a steamer from Fort William to Montreal. Measure the length of the steamer's route.

4. Measure the distance by water and by railway respectively: (*a*) from Duluth to Chicago; (*b*) from Buffalo to Chicago.

The Great Lakes.—These lakes contain the largest body of fresh water in the world; no large rivers enter the lakes, but numerous small streams flow into them. Not only does the evaporation from the lake surfaces contribute to the rainfall of North America, but the great volume of water exerts also a moderating influence on the climate of the surrounding districts; in summer, heat is absorbed by the water; in winter it is radiated, and thus the temperature of the lake region is somewhat modified.

It will be seen from the table (p. 100) that the elevation of the surface of Lake Michigan is practically the same as that of Huron; that Superior is only twenty feet above Huron, and Erie is only eight feet below Huron. Hence, with a little help from man at Sault Ste. Marie and at the River St. Clair there is free navigation between the four lakes.

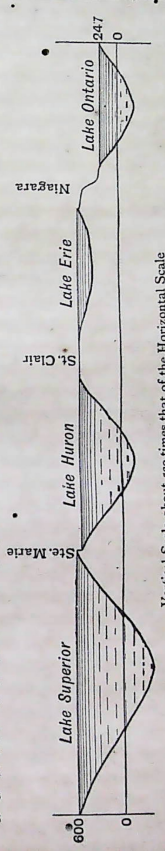
The level of Ontario is far below that of Erie (326 ft.), and this difference in elevation is a serious obstruction to navigation; ships of moderate size can use the Welland Canal, but they must be raised or lowered by means of locks. Between Ontario and Montreal the St. Lawrence is obstructed by many rapids; some steamers navigate this section of the river, and others pass through the Rideau Canal to the River Ottawa.

The traffic on the lakes is also obstructed from December to March or April by the frozen condition of all the rivers, lakes, and canals. Lake Superior never freezes right across,

but the ice, which extends far from the shore into the lake, prevents navigation.

Depth.—Except in the case of Erie, the deepest parts of the lakes are below sea-level. In Fig. 42 the vertical scale to which the diagram is drawn is many times that of the horizontal scale, and so the lakes are represented in an exaggerated form. The length of Lake Superior is about two thousand times that of its greatest depth. If, therefore, a line two hundred inches be drawn to represent the length, then to the same scale the greatest depth would be represented by one-tenth of an inch. From this it will be evident that were Lake Superior drained, the bed would present a vast plain with hardly a variation from the horizontal. In the case of each of the other lakes a similar result would be obtained by taking the same vertical and horizontal scale. The basins of the Great Lakes are therefore really mere scratches on the surface of the continent.

In all the Great Lakes slight movements take place which correspond in some respects to the tide in the ocean; the rise and fall in the lakes vary from about one to three inches. In Lake Superior there are also small waves, or pulsations, which occur at short intervals of time; in the Swiss lakes such pulsations are known as **seiches.**



Vertical Scale about 530 times that of the Horizontal Scale

FIG. 42.—DIAGRAM SHOWING THE LEVELS OF FOUR OF THE GREAT LAKES.

Towns.—Duluth, at the western extremity of Lake Superior, is five hundred miles nearer the grain-growing regions of the North-west than is Chicago. Grain and lumber are shipped at Duluth; iron ore, obtained in the neighbourhood of Duluth, is sent to Cleveland and other ports on Lake Erie. When the waterways between the lakes have been deepened, large ships will start from Duluth for New York, Liverpool, Hamburg, and other distant ports. Ashland and Marquette on Lake Superior also export iron ore.

Milwaukee, on the western side of Lake Michigan, possesses natural advantages of environment greater than those of Chicago, viz. a good harbour, rising ground suitable as the site of a city, a river which provides water-power, and a productive region behind it. It does not stand at the intersection of important routes, and so its progress has been less rapid than Chicago and other towns. It is essentially a manufacturing city—flour, beer, machinery are the chief articles of trade. Milwaukee is an Indian name; the town was founded by a Frenchman (Juneau), and it is largely inhabited by people of German origin.

Chicago is twenty miles from the most southerly point on Lake Michigan; at this point a small river enters the lake, but its course is important, as it is separated from the Illinois valley by a very low pass. At the mouth of this stream, by dredging and by building docks and a breakwater, good accommodation has been made for shipping. In 1830 the population of Chicago was less than 1,000 people, now it is about two millions. The rapid growth of Chicago is due largely to the relation of water and railway transportation. From the prairies, plains, and passes of the Rocky Mountains of the northern part of the United States, railways must pass round the head of Michigan.

Chicago is also a convenient centre for the wheat-growing areas of the west and the maize-growing areas of the south. The chief articles of trade are grain, bacon, lard; machinery and railway rolling stock are manufactured. Meat packing and canning fruit are also important industries.

Detroit is so called from the narrow water passage between Erie and Huron. It was founded by the French at the beginning of the seventeenth century as a fur-trading post. With water traffic alone, Detroit would never have become more than a calling place; but railways running north of Lake Erie enter Canada through Detroit, hence it is at the crossing of important routes. Motor works give employment to a large number of people.

Photo. Brown Bros., N.Y.

FIG. 43.—CHICAGO—TALL BUILDINGS ON THE LAKE FRONT.

Cleveland, on the southern shore of Lake Erie, is at the mouth of the River Cuyahoga. A trading post was established at this place (in 1796) because it was in a direct line between Detroit and Pittsburgh. The prosperity of Cleveland dates from 1834, when the Ohio Canal was opened; for iron ore could then be brought from the mines near Lake Superior through the lakes to Cleveland, and carried by the canal to Pittsburgh; also limestone from the islands in Lake Erie can be taken to the iron furnaces. The rapid growth of the town is due, however, to the opening of the transcontinental railway which runs along the southern shore of Lake Erie;

hence Cleveland stands at the intersection of two very important highways of traffic. The discovery of petroleum and natural gas in the neighbourhood has increased the wealth of the town; and an extensive trade is done in lumber. Large numbers of automobiles are now manufactured at Cleveland.

Other ports on Lake Erie to which iron ore is shipped from the Lake Superior mines are Ashtabula, Conneaut, Erie and Lorrain.

Buffalo, at the eastern end of Lake Erie, has an important position to which the lake trade converges. Because of the obstruction to traffic at Niagara, goods are brought in large lake steamers to Buffalo and are then sent on to New York either by the Erie Canal or by railway. The chief trade of Buffalo is in grain. The manufacture of iron and steel goods is important. Pennsylvania coal is shipped at Buffalo for distribution to the various lake ports. Its lumber trade has been transferred to Tonawanda (Fig. 39).

The Canadian lake ports are described in Lesson VIII.

EXERCISES.

1. State the position and importance of the following canals: Soo, Welland, Rideau, Erie.

2. State the positions of the following towns, and explain why important towns have grown up at these places: Detroit, Duluth, Cleveland, Milwaukee.

3. Describe the importance of the position and of the trade of Buffalo. If the Niagara Falls were situated between Erie and Huron, would the position of Buffalo be as important as it is? Give reasons.

4. What articles are carried by vessels on the Great Lakes? Write an account of this traffic.

LESSON XVI.

THE ATLANTIC COAST.

1. Draw a sketch map of the New England States. Mark the chief towns, and near each town name an important industry.

2. Write in tabular form (*a*) the names of the States on the Atlantic coast south of New York; (*b*) the chief seaport of each State; (*c*) one important fact about the trade of each port.

3. Draw a large sketch map of Chesapeake Bay and of the rivers which flow into the bay. Mark the chief towns which lie within the drainage area.

4. The trade of Philadelphia consists largely of the following articles:

Exports.	£1000	Imports.	£1000
Wheat and Flour,	2,247	Bananas,	233
Illuminating Oil,	2,799	Skins,	1,717
Lubricating Oil,	1,059	Iron Ore,	889
Cotton,	733	Pig-iron,	300
Lard,	459	Nitrate of Soda,	434
Bituminous Coal,	498	Sugar,	2,082
Glazed Kid,	382	Tobacco,	558
Naphtha,	512	Wool,	1,043
Paraffin Wax,	285	Glycerine,	270
Total Value of Exports,	14,500	Total Value of Imports,	18,401

Rewrite in order of value (*a*) the Exports, (*b*) the Imports. Opposite each export write a district of the United States from which the article was probably obtained.

5. CHIEF TOBACCO-GROWING STATES.

States.	Million lbs.	States.	Million lbs.
Kentucky, - -	328	Connecticut, - -	28
Virginia, - -	121	Maryland, - -	18
Ohio, - - -	72	Indiana, - - -	16
North Carolina, -	137	South Carolina, -	25
Wisconsin, - -	48	New York, - -	6
Pennyslvania, -	52	Massachusetts, -	8
Tennessee, - -	62	Total for U.S., -	945

(*a*) Find the above States on a map of North America.

(*b*) Of the total tobacco production of the United States, what percentage is produced in Kentucky, Virginia, and North Carolina respectively?

The New England States.—These States comprise Massachusetts, Rhode Island, Connecticut, New Hampshire, Maine, and Vermont.

New England is a plateau region that has been worn down to its present shape by glaciers; morainic deposits block the river channels, and so many waterfalls and rapids have been formed. The mountain ridges run from north to south, such as the **Berkshire Hills** and **Green Mountains**, and these separate the Connecticut valley from the Hudson valley. The coast-line of Maine consists of rugged rocks with many inlets almost landlocked; in Massachusetts are strips of sandy beach with deep coves; **Cape Cod** consists of hard rock covered with glacial drift. In consequence of subsidence, many hills capped by morainic matter (called *drumlins*) now form islands in Massachusetts Bay.

The Early Settlers.—In 1620 the Pilgrim Fathers landed at New Plymouth, and ten years later Boston was founded by Puritans on the shores of Massachusetts Bay. The colonists approached their settlements from the sea, and for a long period they were confined to the margin of the

coast; to the west, their advance was stopped by a series of mountain ranges. The whole country was thickly covered with forests; trees had to be felled before agriculture could be carried on, and the soils of the cleared land proved to be of poor quality. The climate also was severe, and violent storms beat on the coast lands.

The settlers in New England had a hard struggle for existence; many of them took to sea fishing in order to get a supply of food; some took to lumbering; while others became farmers and forced a living from the poor soils. In all these occupations the colonists showed great energy and perseverance.

Water Power.—In later times, water power has made New England into a great industrial region. Waterfalls and rapids are found in nearly all the rivers, and they have been utilised for driving machinery. Factories were built and towns grew up at these places.

In Connecticut and Massachusetts practically every waterfall is used because of the nearness of the great commercial centres of New York and Boston; but in Maine, the water power of the interior is still unused (except to drive sawmills), the only manufacturing towns, such as **Lewiston** and **Augusta**, being in the south-west corner of the State.

During the nineteenth century the application of steam power to machinery led to a great development in the manufacturing industries of New England.

Industries.—The humidity of the atmosphere in some parts of New England (as in south Lancashire) favoured cotton-spinning; raw cotton from the Southern States is brought by sea or by railway *via* New York, while coal can be obtained from the Appalachian Coalfield or from Cape Breton Island.

Fall River, on a branch of Narragansett Bay, is the most important cotton town. Other cotton towns are **Lowell**, **Lawrence**, and **Manchester** in the Merrimac valley; and **Lewiston** and **Augusta** in Maine. Carpets are made at **Harford** and **Lowell**; boots and shoes at **Lynn** and **Brockton**; machines and

tools at **Worcester** and **Providence**; watches and brassware at **Waterbury**; and paper-making at **Holyoke**. **Bangor** is a lumber town.

Agriculture and fishing are of less importance than in former times. In the case of **agriculture**, many New England farmers have been attracted to the prairies and the wheat lands of the west, where the conditions are much more favourable to them. Hence in many districts of New England the land is going out of cultivation, and in course of time it will probably be covered again with forests. Extensive areas in Maine, New Hampshire, and Connecticut have always been covered with forests—pine and spruce being the chief trees. Afforestation or forestry is now being practised in these States. There are many sawmills for the lumber trade and crushing mills for the preparation of wood pulp for paper-making.

The **fishing** industry is now centred at Gloucester, near Cape St. Ann. The decline of fishing is due chiefly to the competition of (*a*) Canadian and Newfoundland fisheries; (*b*) the fisheries in Chesapeake Bay and in the Great Lakes; (*c*) the fisheries of the Pacific coast (especially salmon); and (*d*) various preserved (canned) foods which are used in place of fish.

Ports.—The towns largely engaged in coasting trade are Boston, Portland, New London, and Providence. **Boston** is the only great port of New England. It is situated on an inlet of Massachusetts Bay at the mouth of the River Charles. It is one of the oldest towns in the United States, and is of great historical interest. Boston not only has enormous coasting trade, but also trade with Great Britain, Germany, and many other countries. Railways have made Boston an outlet for the produce of the West. Various industries, such as the manufacture of boots and shoes, are carried on in the city. On the other side of the River Charles is **Cambridge**, noted for the University founded by John Harvard in 1636.

Boston was named after a town in Lincolnshire; the

Indian word Massachusetts means 'Great hills,' a name first applied to the hills just west of Boston and afterwards to the whole colony.

The Atlantic coast plain.—South of New York the coastal plain broadens out until it is more than 150 miles from the

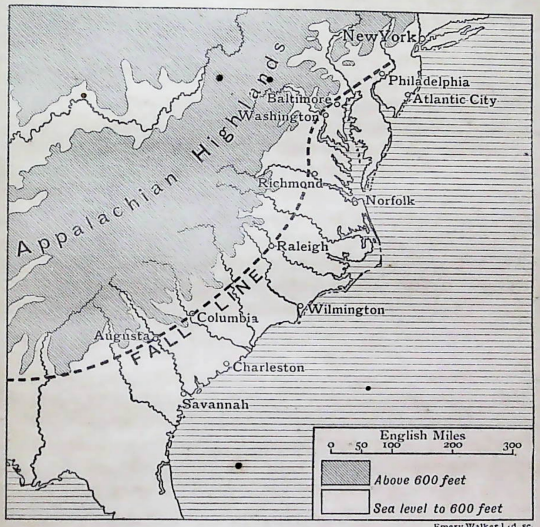


FIG. 44.—THE ATLANTIC COAST PLAIN AND THE FALL LINE.

coast to the six hundred foot contour line. The coastal plain of North Carolina, South Carolina and Georgia was once below sea-level, and consequently the surface formations consist largely of loose, marine deposits across which many rivers cut their way to the coast in almost level channels. Before reaching the coastal plain, however, these rivers have crossed an undulating belt of resistant rocks partly

covered with Piedmont gravel. Where the rivers pass from these hard rocks to the weak strata of the coastal plain, waterfalls and rapids occur. A line, drawn on a map to connect these waterfalls, is called the **Fall Line** (Fig. 44), and it marks the limit of navigation on the various rivers.

North of Pamlico Sound, subsidence has taken place, in consequence of which Delaware Bay, Chesapeake Bay, and others are **drowned valleys.**

The coast line from New Jersey to North Carolina is fringed with sand reefs which are surrounded by shallow water; on this coast are many seaside towns for holiday-makers, such as **Atlanta City** (situated on a sand reef). On the coast of North Carolina the sweep of the ocean currents has formed sand reefs, or banks, which seem to project outwards to the sea; the most notable examples are **Cape Hatteras** (the reef of which encloses the shallow Pamlico Sound), Cape Fear, and Cape Lookout. Off the coast of South Carolina are many sand reefs and also many islands which are detached parts of the main land.

In **Georgia** and **South Carolina** the following natural divisions should be noted:

(*a*) The sea islands partly covered with palmetto (the cabbage tree), cedar, myrtle, etc., and famous for long-staple cotton;

(*b*) The swamp region of rich alluvial lands and deltas with dense semi-tropical vegetation and suited for rice-growing;

(*c*) The forest belt thickly covered with pitch-pine;

(*d*) The hilly country (west of the Fall line) on which cereals and short-staple cotton are grown;

(*e*) The Appalachian foreland in which minerals are found.

Just north of Charleston (South Carolina) there is a deposit of **phosphate rock**—this deposit covers an area seventy miles long and thirty miles broad, and it is chiefly used in the preparation of fertilisers.

Towns.—The distribution of towns is due largely to (1) the advantage of water power at the Fall line, (2) the commercial importance of navigable estuaries.

Among the towns on the Fall line may be mentioned **Augusta** on the River Savannah at the head of steamboat

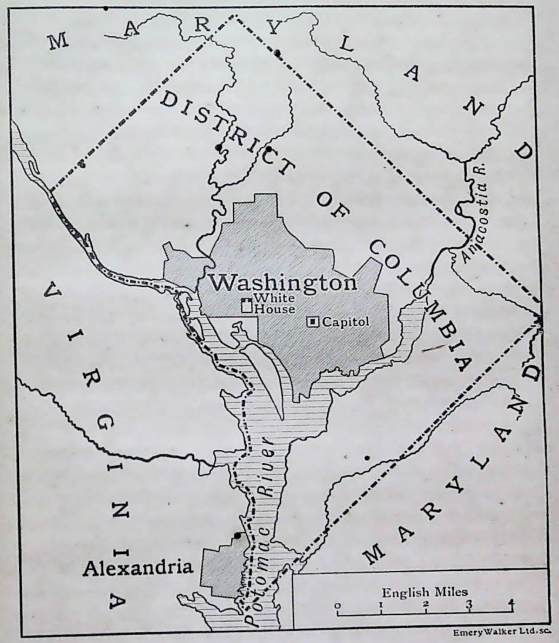


FIG. 45.—WASHINGTON.
The political capital of the United States, situated in the District of Columbia.

navigation; the water power is used in cotton mills. Cotton is grown in the surrounding districts.

Columbia, on the Congaree River, is the capital of South Carolina. **Raleigh,** on the R. Neuse, manufactures iron

goods, clothing, carriages, etc.; it is the capital of North Carolina.

Richmond, on the James River, stands at the head of the tidal water; although 150 miles from the Atlantic, ships drawing fourteen feet of water can reach the town; cotton, flour, tobacco, and apples are the chief exports. Just above the town are the James River Falls, which provide water power for tobacco factories, iron foundries, and flour and paper mills. Richmond is the capital of Virginia.

Washington, in the District of Columbia, is on the River Potomac, fifteen miles below the Falls; the Falls are used to supply the city with water and to generate electricity for lighting and other purposes. Washington is the political capital of the United States; among the Government buildings are the Capitol and the White House (the residence of the President).

Philadelphia, at the junction of the Rivers Delaware and Schuylkill, is about one hundred miles from the sea. It is the chief city of Pennsylvania, founded by William Penn, the Quaker, in 1682. Here the **Declaration of Independence** was signed in 1776.

Philadelphia is one of the great seaports of the United States, taking rank after New York and Boston. Its position and railways make it a convenient outlet for the Pittsburgh district, petroleum and coal being important exports. Grain from the Western States is also exported. Many steamship lines have regular sailings from Philadelphia.

Locomotive works, shipbuilding yards, textile factories (especially for carpets, woollens, cottons) employ large numbers of people.

Trenton, a few miles distant, is an important centre for pottery and chinaware.

Baltimore, on an arm of Chesapeake Bay two hundred and fifty miles from the Atlantic, is the chief city of Maryland. From Baltimore, **Norfolk** and **Newport News** large quantities of coal are shipped annually to Cuba and Mexico. Wheat and maize are exported from Baltimore, and new grain elevators

have been erected to facilitate the movement of the grain. Ships of moderate size are built at Baltimore, while cotton, woollen and iron goods are manufactured.

The culture of oysters is carried on extensively in Chesapeake Bay, and canning oysters for export is an important industry.

Norfolk, a port of entry into Virginia, is on the River Elizabeth, and with Portsmouth on the opposite bank it forms an important naval station. Between Chesapeake Bay and the estuary of the James River are the **Hampton Roads** used by American warships.

Savannah, near the mouth of the River Savannah, is an important station for naval stores. The chief articles of trade are cotton, cottonseed, turpentine and lumber (from the pitch-pine forests), and rice. **Charleston** is at the junction of the Rivers Ashley and Cooper; the harbour is obstructed by a shifting sand bar at the entrance. The coasting trade of Charleston is more important than the foreign trade. The chief exports are fertilisers, cotton, rice, turpentine. **Wilmington** in North Carolina is about thirty miles from the mouth of Cape Fear River; the exports are cotton, rice, turpentine.

Virginia.—After Raleigh's two unsuccessful attempts to colonise Virginia, a permanent settlement was made on the James River at the beginning of the seventeenth century (1606). The colonists found that the climate of the country was warm and genial, the virgin soils were rich and productive, and food could be obtained without much difficulty. They also found that the conditions favoured the cultivation of tobacco, and this crop was soon produced in large quantities by means of slave labour; hence plantations developed rather than towns, and the inhabitants were scattered over large areas. The numerous waterways provided by the rivers and by the various branches of Chesapeake Bay were used for the transport of goods, and consequently few roads were made. Living on large estates more or less isolated from each other, the **Virginians** became self-reliant and ever ready

to defend their possessions. To the west of the colony rose the Appalachian Highlands, thickly covered with forests and frequently infested by Red Indians, and so for a considerable time the Virginians remained on the coastal plain. When the French built Fort Duquesne (now Pittsburgh) on the River Ohio, the colonists crossed the mountains and made a series of attacks upon it. Later the Virginians took a leading part in the War of American Independence.

Bermudas.—This British colony, situated nearly six hundred miles from the coast of Carolina, consists of a group of more than one hundred islands (of which only twenty are inhabited) and a large number of rocks. The islands were named after Bermudas, a Spaniard, who sighted them in 1515; the shipwreck of Sir George Somers, an Englishman, in 1609, brought the islands under the notice of the English colonists in Virginia, and men were sent to settle on the largest islands of the group.

Hamilton is the chief town.

As the Bermudas (32° N.) lie far out in the Atlantic Ocean, the climate is tempered by sea breezes, frosts are unknown, and the air is always moist. In the warm waters which surround the islands, the coral is able to live and the reefs therefore are constantly growing. The soil on the islands is poor in quality, but onions, potatoes and other vegetables are grown in large quantities and are exported to New York.

In recent years, the Bermudas have become a favourite winter resort for visitors from the United States. To Great Britain, however, the Bermudas are chiefly important as a naval base on the North America and West India Station, with dockyard and victualling establishment.

EXERCISES.

1. Compare New England and Virginia as regards physical features, climate and occupations of the people. Say what you know of the early settlers in each district.

2. In the otton factories of New England at the present time there are about 19 million spindles, of which 11 million are in Massachusetts; in the factories of the Southern States

there are about 13 million spindles, of which $4\frac{1}{2}$ million are in South Carolina and $3\frac{1}{2}$ million in North Carolina.

Point out the importance of these facts, and explain the suitability of each district for the cotton industry.

3. Why is farming in New England less important than formerly? What industries are now carried on in the interior of the district?

4. Describe the Atlantic coast from Delaware Bay to the mouth of the River Savannah.

5. Explain the term "Fall Line," and point out its importance with regard to towns and industries.

6. Say what you know of the following: drumlins, piedmont gravel, phosphate, sand reefs.

7. Describe the position and importance of the Bermudas.

LESSON XVII.

EASTERN HIGHLANDS AND APPALACHIAN COALFIELD.

1. Draw a sketch map of the Eastern Highlands. Mark the names of the different parts of the Highlands (*e.g.* Cumberland Mountains, Catskills, etc.); also mark the chief rivers which flow from the Highlands.

2. Measure the distance in miles from Duluth to Pittsburgh:
   (*a*) By railway, *via* Chicago;
   (*b*) By water, *via* the Great Lakes.

Also measure the direct distance in miles:
   (*a*) From Pittsburgh to New York;
   (*b*) From Pittsburgh to Birmingham.

3. The iron mines of the Lake Superior country produce about eighty-five per cent. of the total output of the United States. The iron ore from this district was mostly shipped from the ports in the subjoined table.

SHIPMENTS OF IRON ORE.

Port.	1000 tons.	Port.	1000 tons.
Duluth, - -	9,715	Marquette, - -	2,730
Superior, - -	13,179	Escanaba, - -	4,766
Ashland, - -	4,166	Two Harbours, -	8,352

Find the total quantity of iron ore shipped from these ports and make out a percentage table. Mark the ports on a sketch map of the Great Lakes, and trace the route along which the iron ore was carried to Pittsburgh and other smelting centres.

4. Iron ore is smelted chiefly in the following States, and nearly 30 million tons of pig iron are produced every year.

PRODUCTION OF PIG IRON.

States.	1000 tons.	States.	1000 tons.
Pennsylvania, -	12,753	New York and New Jersey,	2,082
Ohio, - -	6,966	Alabama, - - - -	1,960
Illinois, - -	2,907	Indiana and Michigan, -	1,773

Find the positions of these States in relation to the Appalachian Coalfield. From the quantities given in the above table make a percentage table for the various States, and draw a diagram (taking a column 10 inches high to represent the total production of pig iron).

The Eastern Highlands.—From New York State to Alabama the Appalachian Highlands consist mainly of folded strata, bounded on the east by a ridge of hard crystalline rock, and on the west by the escarpment of the Alleghany plateau. Under the stress of great lateral pressure the horizontal strata have been bent into a series of folds.

(*a*) The original folds were worn down gradually to a plain which sloped gently to the south-east. Across this plain, rivers, such as the Delaware, Susquehanna, Potomac and others, must have followed practically the same courses as at present.

(*b*) This plain was then uplifted and the streams began to flow more quickly and to cut notches or gaps in the ridges of hard sandstone; in this way the Susquehanna water gap was formed.

(*c*) While the main streams were doing this, smaller streams were being formed on the softer strata (limestone, shale, etc.),

FIG. 46.—A WATER GAP, RIVER SUSQUEHANNA.

and they eventually became tributaries of the larger rivers. The main streams therefore appear to be independent of the relief as they flow across the direction of the ridges, while the tributaries flow in the longitudinal valleys between the ridges. The river valleys, water gaps, and even the contour of the mountains are all due to **erosion.**

The middle section of the Appalachians, from the River Hudson to the River James, contains the three belts of which the mountain system as a whole is composed. In the **longitudinal valleys** the watercourses follow the strike of the weaker strata, but now and again they cross from one valley to another, through gaps which run transversely to the ridges. The chief rivers, such as Susquehanna, rise in the plateau and flow across the **folded strata** and then through the **crystalline gaps** to the sea; (the James River, however, rises in the folded belt instead of in the plateau, and the Hudson has its headwaters in the Adirondacks and Catskills). In or near the gaps, rapids and falls occur, *e.g.* the **Falls of the Potomac,** the **Schuylkill Falls,** and others; hence the rivers of the Appalachians are not navigable. Navigation only begins where the rivers have been converted into estuaries and bays, such as Delaware Bay and Chesapeake Bay. The estuary of the Hudson, however, is a deep, navigable water channel which extends right through its gorge in the highlands.

The northern extension of the Appalachians in the New England States consists chiefly of crystalline and igneous rocks, and the folded strata of the middle section disappear. The whole region once formed a plateau which has been worn down to its present state by glaciers and afterwards by rivers. The mountains of New England are noted for their irregularity; isolated masses called **Monadnocks** (after Mount Monadnock in New Hampshire, 3,000 ft.) rise to considerable heights; **Mount Katahdin** in Maine is one of the highest of such masses, being over 5,000 feet, while the **White Mountains** in New Hampshire form a group of monadnocks. The **Hoosac Mountains, Green Mountains,** and others are ridges which sepa-

rate the valleys of the Connecticut and the Hudson. Many rivers with falls and rapids flow across Massachusetts, New Hampshire, and Maine; the coast-line of these States consists of rugged rocks with deep coves and strips of sandy beach; many of the rocky islands are rounded glaciated hills which once formed part of the mainland.

In the **southern section** of the Appalachians, the crystalline belt known as the Blue Mountains or Unakas (Great Smoky

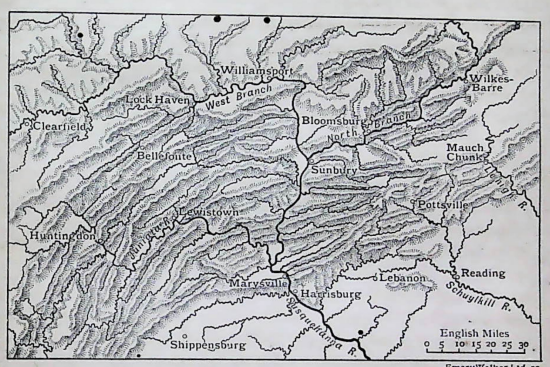


FIG. 47.—A SECTION OF THE APPALACHIAN HIGHLANDS.

Note the rivers flowing sometimes parallel to the ridges, sometimes at right angles to them.

Mountains) becomes broader and higher in Carolina; Mount Mitchell, 6,700 ft., is the highest peak in the Appalachians. As a rule the mountains in this section are rounded rather than rugged; the valleys between the ridges are of considerable elevation, reaching in some cases a height of two thousand feet. The rivers follow the open valleys; there are few waterfalls. Rivers such as the Savannah, Congaree, and others flow from the east side of the crystalline belt to the Atlantic; the Tennessee flows through the broad

valley lowland of the folded belt and then through the plateau belt to the Mississippi.

The Alleghany Plateau.—This plateau consists of strata only slightly disturbed from the horizontal; the dip slope is towards the west, and the scarp slope facing east appears to rise as a steep ridge from the folded strata of the central belt of the Appalachians.

In Tennessee and Kentucky the escarpment is called the **Cumberland Mountains**; in West Virginia and Pennsylvania the **Alleghany Mountains**; in Northern Pennsylvania the escarpment becomes obscure, but it reappears in the **Catskills** with steep slopes to the Hudson and Mohawk.

In the north-west the plateau suffers only a gradual decrease of height and relief until the prairie plains are reached in Central Ohio, South Indiana and Illinois.

Many rivers, such as the Sandy River, Kanawha, and others, flow from the plateau to the Ohio valley. Where rivers have cut gorges in the plateau, the layers of rock on one side correspond to those on the other side.

In Eastern Kentucky, the land slopes gradually from the Cumberland Mountains towards the Ohio; this is known as the **Blue Grass Country.** It is composed of fossil-bearing limestone, and the soil formed from it presents a striking contrast to (*a*) the drift soils due to glacial agencies and (*b*) to the barren sandstone uplands close by. Tobacco is extensively cultivated in the Blue Grass Country. In passing through the limestone, the streams have worn out great caverns, the best known being the Mammoth Cave.

In Tennessee, between the Cumberland Mountains and the Unaka Mountains, there is a great valley a hundred miles wide; along its western edge the Cumberland escarpment rises boldly to a height of 100-200 ft. The River Tennessee, formed by the Rivers Clinch and Holston, flows through the valley. **Knoxville,** the chief town, is situated amidst picturesque scenery.

The Appalachian Coalfield.—The United States is the greatest coal-producing country in the world, four hundred

million tons being raised every year (the quantities raised in Great Britain are 264 millions and in Germany 167 millions). The largest coalfields in the United States are:

(1) The **Appalachian**, which extends from the State of New York to Alabama;

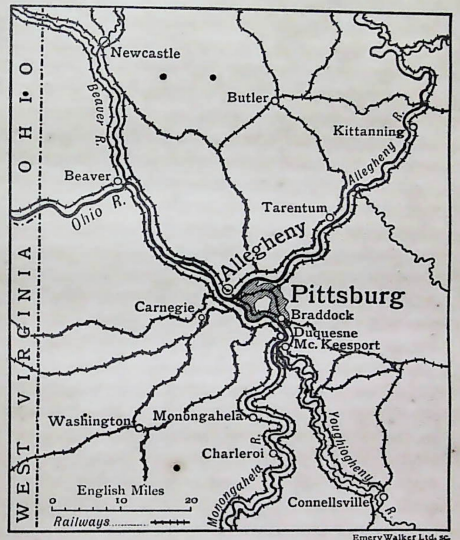


FIG. 48.—PITTSBURG.
The great centre for iron goods, and a meeting place of rivers and railways. In American geographies the name is spelt Pittsburgh.

(2) The **Central** coalfield in Illinois, Indiana and Kentucky; and

(3) The **Western** coalfield in Iowa, Missouri and Kansas.

Coal is also mined in small quantities in districts near the Rocky Mountains, in the Pacific States, in Texas and in Michigan.

The Appalachian Coalfield yields both anthracite and bituminous coal. The hard anthracite is mined chiefly in Eastern Pennsylvania, Scranton and Pottsville being important centres for its production. Deep shafts have to be sunk to reach the coal beds. The smokeless anthracite is used largely on warships, and it is burnt in slow-combustion stoves for heating buildings. Bituminous coal is found in far larger quantities than anthracite. In many parts of the Appalachian Coalfield the coal is mined by means of horizontal galleries which are entered from the hillsides, and so shafts are unnecessary. For use in the blast furnaces the bituminous coal is first turned into coke; this is done by heating the coal in ovens from which the air is almost excluded. The coke thus obtained gives great heat and contains little sulphur or other substances harmful in iron smelting. The preparation of coke is largely carried on at **Connellsville**, forty miles from Pittsburgh. From bituminous coal, gas is made for lighting, heating, and cooking. Coal-tar is a useful by-product from which is obtained the aniline dyes used in the textile factories.

Oilfields. **Petroleum** (rock oil) is obtained in large quantities (1) in the district round Pittsburgh and (2) in a district which lies west of Cleveland and stretches through Ohio into Indiana. There are also oilfields in many other States. The oil from the Pittsburgh district is of superior quality; a residuum of paraffin is left after the illuminating oil has been removed, and from this paraffin can be manufactured celluloid articles, aniline dyes and vaseline. The coarser oils obtained in Ohio, Illinois, Texas and California leave a residuum of bitumen which can only be used for fuel.

In the Pittsburgh district the oil is obtained from borings in the horizontal strata; it is pumped into pipes and conveyed to refineries; after undergoing various processes the refined oil is distributed in tank cars on the railways, or it is exported in bulk or in barrels on steamers to many parts of the world. From the wells at **Bradford**, **Oil City** and **Olean**, oil is pumped through pipes to Buffalo, New York and Philadelphia.

Petrol, a highly refined oil, is used as spirit for the engines of motor cars, while the heavier oils are utilised for lubricating purposes.

Natural Gas occurs in the Pittsburgh district near Cleveland and in many parts of the Ohio valley; it is used for lighting and heating purposes. Natural gas was formed under practically the same conditions as those which led to the

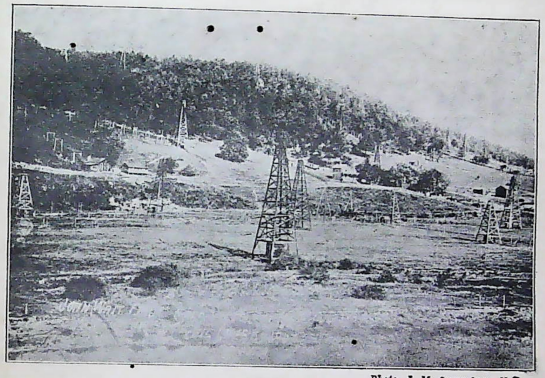


Photo. J. M. Cummines, N.P.

FIG. 49.—OIL WELLS, PENNSYLVANIA.

production of petroleum, that is, where rocks rich in organic matter are overlaid by impervious strata.

Iron Smelting and Manufactures.—The two chief districts in the United States for iron ore are: (1) the districts near **Lake Superior** and (2) the **Southern Appalachian Region** between Maryland and Alabama.

The local iron mines of the Pittsburgh district have been worked out, and the blast furnaces are now supplied with the fine ores from Lake Superior. The latter are obtained from low ranges of hills at no great distance from the lake. In many cases, the ore is taken from open pits by steam

shovels and placed in trucks; short railways carry the ore to the lake ports Duluth, Ashland, Marquette and others.

As there is no coalfield near Lake Superior, the ore has to be transported through the lakes to Cleveland on Lake Erie, and thence by canal or rail to the Pittsburgh district, where it is smelted with coke as fuel. The distance from the Lake Superior iron mines to the furnaces at Pittsburgh is about a thousand miles; it is found to be more convenient and cheaper to carry the ore to the coalfield where the metal is required in the great iron-works for the manufacture of hardware and machinery, than to carry coal to the districts

Photo. R. W. Johnston.

FIG. 50.—PITTSBURGH.
Note the tall factories.

where the iron ore is mined. Some of the ores from the Lake Superior mines is smelted in the Mahoning valley in Ohio, in the Shenango valley in Pennsylvania, and also near Chicago.

Pittsburgh (with Alleghany on the opposite side of the river) is the chief iron centre.

Johnstown, Newcastle, McKeesport, Youngstown, Wheeling are other important iron towns.

Albany and Schenectady specialise in railway rolling stock; Auburn and Syracuse in farm implements.

Steel ships are built at Philadelphia.

In the **Birmingham district** in Alabama, iron ore, coal and limestone are all found close together; hence the cost of iron

smelting is much reduced. Birmingham, on the site of a former cotton field, is the largest centre in the south for iron and coal mining, for blast furnaces and rolling mills. The nearest ports of this district are Pensacola and Mobile on the Gulf of Mexico.

Chattanooga, on the Tennessee, is noted for its iron-works, cotton factories and sawmills.

Copper.—This metal is found in large quantities in the Keweenaw peninsula in Michigan near Lake Superior. The mines in this district yield pure copper, and the metal is found distributed through the rocks in sheets or fine particles. The deposits often occur at great depths, and the rock has to be crushed to get the metal; this is done at many centres near Pittsburgh. Copper ore is found in Montana (especially at Butte and Anaconda) and in Arizona; the ore from these mines often contains small amounts of gold and silver. Copper wire is largely used in electrical fittings, and alloyed with zinc, copper is used for making coins, brass, etc.

EXERCISES.

1. Explain, with reference to the Eastern Highlands, the terms (*a*) folded mountains, (*b*) water gaps, (*c*) monadnocks, (*d*) longitudinal valleys.

2. Briefly describe the changes which must have taken place to account for the present surface features of the Appalachians.

3. Write an account of (*a*) the mountains of the New England States, (*b*) the Alleghany Plateau.

4. Where are the following obtained in the United States: iron ore, copper ore, coal, petroleum, natural gas?

5. In what circumstances has Pittsburgh become the chief centre of the iron and steel trade? What other districts and towns of U.S.A. are engaged in the same industry?

6. What kinds of coal are mined in the United States? To what use is each kind of coal put?

7. Say what you know of the coal and iron district of Alabama.

8. How is petroleum obtained? To what uses is petroleum put?

LESSON XVIII.

THE MISSISSIPPI BASIN AND PRAIRIE LANDS.

1. Draw a sketch map of the Mississippi and its chief tributaries. Thicken the navigable part of each river. Mark the towns which occur in the description on pp. 123-131.

2. The chief States for growing wheat are given in the subjoined table. (*a*) Find the average quantity produced in each State for the period 1910-14.

(*b*) Rewrite the list in order of average quantities.

(*c*) Mark the wheat-growing States on a map, and shade the six States which produce most wheat.

CHIEF WHEAT-GROWING STATES.

States.	1910. mill. bush.	1911. mill. bush.	1912. mill. bush.	1913. mill. bush.	1914. mill. bush.
Kansas, - -	62	54	92	87	177
North Dakota, -	36	64	144	79	82
Oklahoma, -	25	9	20	18	48
Illinois, - -	32	36	10	42	46
Missouri, - -	25	34	24	40	43
Indiana, - -	41	40	10	40	43
Minnesota, -	94	63	67	68	43
Washington, -	26	36	53	53	42
Ohio, - - - -	31	33	10	35	37
South Dakota, -	47	15	52	34	32
Pennsylvania, -	28	21	22	22	24
Oregon, - -	16	17	21	16	17
Texas, - -	19	12	11	14	14
Nebraska, - -	40	40	55	62	8
Total for U.S.,	695	656	730	763	891

It should be noted that the quantity of wheat raised in these States varies considerably from year to year; this is partly accounted for (*a*) by an increase or decrease in the area under cultivation, (*b*) by the changes in weather conditions which result in good or bad harvests.

3. Measure the length of the Mississippi (*a*) from its source to St. Louis, (*b*) from St. Louis to New Orleans. Also measure the Missouri from its source to St. Louis and the Ohio from Pittsburgh to Cairo.

4. From a contour map find approximately the elevation of the following towns: St. Paul, St. Louis, Bismarck, Omaha, Kansas City, Pittsburgh, New Orleans.

5. From the quantities given on page 137 make a percentage table of the various cereals. Draw a diagram to represent the percentage table.

The Mississippi Basin.—This basin is bounded on the east by the Appalachian Highlands, on the west by the Rocky Mountains, and on the north by a low divide of moraine hills.

The Mississippi (= Father of Waters) rises at an elevation of fifteen hundred feet in Lake Itasca, one of the moraine lakes of Minnesota; it flows very slowly across the prairie lands formed of glacial drift. In this part of its course are several rapids and waterfalls, and near the **Falls of St. Anthony** are the cities **St. Paul** and **Minneapolis.** Minneapolis is named from the Falls of Minnehaha (= laughing waters); the falls are situated on a small stream that enters the Mississippi just below the Falls of St. Anthony. (Cf. Longfellow's *Hiawatha.*) From these towns to the junction with the Missouri, the Mississippi flows through a valley bordered by hills three to four hundred feet high and with a flood plain three or four miles wide. **Lake Pepin** is an expansion of the river across the flood plain just above the mouth of the Chippewa, a tributary which brings much silt into the main stream.

Between the junctions of the Missouri and the Ohio the flood plain broadens out, and is bounded by limestone cliffs, and there are many islands due to the deposits brought down by the Missouri. The Mississippi is subject to less fluctuation in volume than the Missouri or the Ohio; the river reaches its highest level from February to July, and its lowest level in December.

The Missouri (=big muddy river) rises in the Rocky Mountains in Montana, and in its upper course it receives the Milk River and the Yellowstone. At first the Missouri is a mountain torrent flowing swiftly through deep gorges and glacial lakes. The melting snows on the Rocky Mountains supply the stream with water; in June the volume is greatest,

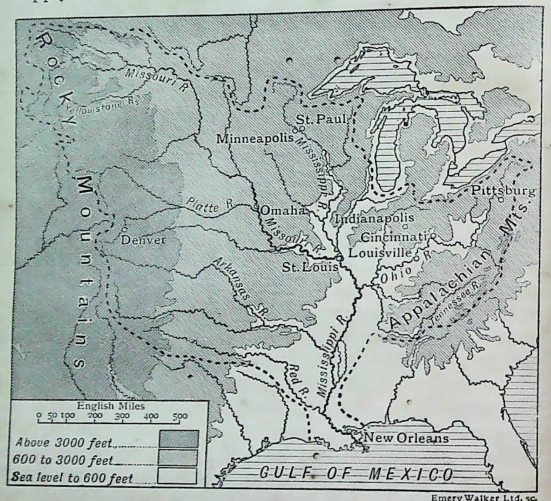


FIG. 51.—THE MISSISSIPPI BASIN.

being then twenty or thirty times that in November. As the Missouri crosses the great plains its volume decreases on account of the slight rainfall and evaporation; its current becomes overloaded with sediment. The valley of the Missouri consists of three trenches one within another, (1) a broad valley bordered by bluffs or terraces, (2) a trench filled by the river at high water, and (3) the low water channel.

The Ohio is formed of two streams: the **Monongahela** from

West Virginia, and the **Alleghany** from north-west Pennsylvania. These streams unite at Pittsburgh, and from this point to the Mississippi is a distance of about a thousand miles. There are many shoals and rapids separated by reaches of deep water. In the lower part of its course the Ohio has a valley of great breadth with a flood plain ten miles wide, while the bluffs on each side become low in height.

The volume of water in the Ohio varies greatly at different seasons. During the spring months the melting snows and heavy rainfall cause disastrous floods, the high-water level often being fifty feet above that of low water; there are no lakes to equalise the discharge as in the case of the St. Lawrence.

A great dam is being constructed across the Ohio just below Pittsburgh in order to regulate the flow of water. Eventually the whole of the Ohio from Pittsburgh to Cairo will be improved in this way, thereby securing a navigable depth of water throughout at all seasons of the year.

The Ohio receives many tributaries from the Appalachians, such as the Tennessee, Cumberland, Kentucky and others.

The lower Mississippi.—From the junction of the Ohio to the Gulf of Mexico the direct distance is about six hundred miles, but the Mississippi has so many windings that it actually flows more than a thousand miles. In this part of its course the Mississippi cuts its way across the great **alluvial plain** which has been formed to a large extent by the river itself. The **flood plain** is bounded on the east by bluffs of clay one to three hundred feet in height; on the west also are bluffs as far south as the Red River, but they are less prominent. In times of flood the Mississippi often changes its course and frequently divides into two or more channels. Hence there is a tendency for the river to increase its length by making fresh bends and to shorten its course by cutting off bends (examples of cut-offs are to be seen near Greenville (Miss.), Lakes Chicot, Lee, etc.). In consequence of the frequent overflowing of the river, the banks have been gradually raised by the deposits of sediment; such banks are

called **levées**, and in many cases they have been raised and strengthened by artificial means in order to prevent the dangers of flooding. As a result of this, the surface of the plain is mostly below the level of the river, and this low-lying land is traversed by a network of side channels and sluggish streams, such as the **St. Francis**, the **Yazoo**, **Tensas** and many others. Below the Red River, the waters are discharged through numerous *bayous*, or side channels, into the Gulf of Mexico.

The **Atchafalaya** is a distributary which enters the Gulf of Mexico a hundred miles west of the main stream.

The volume of water in the Red River is more constant than that in the Missouri, Platte or Arkansas; this is due to the heavier rainfall in the upper valley. During the floods, trees are carried down the stream, and they form natural rafts which prove a serious obstruction to navigation. A channel is kept open by **snag boats**, which break up the rafts and drag the trunks to the bank.

The load of silt carried by the Mississippi to the Gulf forms a **delta**; owing to the decrease in the velocity of the current, shallow lakes are formed, *e.g.* Lake Pontchartrain on the east and Grand Lake on the west. The strength of the current in each of the four distributaries is great in comparison with the slight movements of the waters in the Gulf, hence each distributary is extending the delta further out into the Gulf. The mouths of the distributaries are called *passes*.

The Prairie Lands.—The treeless prairies lie between the Rivers Ohio and Missouri on the south and the Great Lakes on the north. Illinois and Iowa are typical prairie states; in Nebraska and Dakota the prairies end near the 1,200 ft. contour line.

The clayey soils of the prairies consist of glacial drift varying in thickness from thirty to one hundred feet. From a distance, the plains appear to have a perfectly level or an undulating surface; hence they are often called **rolling prairies**, but the view is sometimes interrupted by lines of trees along the watercourses which intersect the plains, or by belts

of low moraine hills which rise gently to a height rarely exceeding a hundred feet. In the hollows are many small lakes, and dotted over the surface of the plains are many boulders.

It is uncertain whether the treelessness of the prairies is due to the quality of the soil, to fires caused by the Indians, or to natural causes. When first explored the prairies were covered with a rich growth of grass and flowering plants. Now large areas have been ploughed, and they yield abundant crops of wheat, maize and other crops. On these cultivated areas are many villages and small towns, but no large cities.

Wheat is grown extensively on the northern districts of the prairie lands. The grain is carried by rail to the great elevator centres, Duluth, St. Paul, Chicago and others. The wheat is handled in bulk, and grain steamers on the rivers and lakes carry the wheat to Buffalo (for New York) or to Montreal for export. Minneapolis is the largest milling centre in the world.

Maize is grown in enormous quantities south of the wheat belt, especially near lat. 40° N. In the United States, maize is known as Indian corn (or corn); the green unripe pods or ears are eaten as a vegetable; corn-flour and hominy are prepared from maize. It is also used as food for cattle. The greatest meat-packing industry is carried on in the centre of the corn belt, *e.g.* Cincinnati and Chicago.

The Ozark Plateau, between the Rivers Missouri and White, resembles the Alleghany plateau in many respects; it has a broad, flat surface which has been dissected by river gorges. The people live chiefly in the wide valleys and practise agriculture. In the St. Francois ridge of the plateau there are some iron mines. The southern part of the plateau decreases in height, but becomes more rugged; it is, however, well forested but thinly populated.

The Ouachita Mountains in Arkansas are very similar to the Central Appalachians; the folded strata have been worn down to a series of valleys between which the harder rocks stand up as ridges of moderate height. Streams have cut

through the ridges in water gaps. Farming is carried on in the valleys, but the people are somewhat backward.

Towns.—La Salle and other French explorers discovered the courses of the Ohio and Mississippi. From the Great Lakes some of them entered the Ohio valley, some reached the upper Mississippi valley, and others from Louisiana travelled up the course of the Mississippi. The settlement of these valleys did not take place until after the War of Independence (1783). The prairie lands were then occupied by men who crossed the Appalachian Highlands and travelled west *via* Pittsburgh. The Blue Grass Country in Kentucky was reached by men who crossed the mountains from Virginia. The development of the resources of the Mississippi basin belongs, therefore, to the nineteenth century.

The Mississippi is the natural outlet for the prairie lands; the river is navigable from **New Orleans** to **St. Paul**; the Ohio is navigable to **Pittsburgh**. Canals connect the headwaters of the Ohio and Mississippi to the Great Lakes. Down to the middle of the nineteenth century, enormous traffic was carried on along these waterways, and this traffic brought prosperity to the towns along the routes.

Railways have, however, brought about a great change; they provide outlets to the Atlantic ports and to the Great Lakes; hence the productions of the prairie lands are sent to New York and Chicago instead of to New Orleans. Coal and lumber are still carried down the Ohio from the Alleghany Plateau in small river boats to various points along the rivers; the traffic by river, however, tends to become more and more local in character, while railways absorb long-distance transport.

St. Louis was first of all an outpost for the fur trade, but with the development of the prairie lands this trade gave way to grain, cotton, timber and meat. In 1913, however, a great sale of Alaskan sealskins and blue foxskins took place at St. Louis (because of its central position); up to that time the skins had been sent to London for sale. St. Louis has a good position for river traffic, but now railway traffic is more

important. One hundred and fifty miles above St. Louis the Keokuk dam holds up the water of the river; in connection with this work the navigation of the river has been improved, and electric power has been supplied to the city. East St. Louis, on the opposite side of the river in Illinois, has a great market for horses, mules, cattle and sheep.

St. Paul and **Minneapolis** are important towns on the wheat belt, and are noted for flour mills; flour and lumber are sent down the Mississippi or they are carried by rail to Duluth or Chicago.

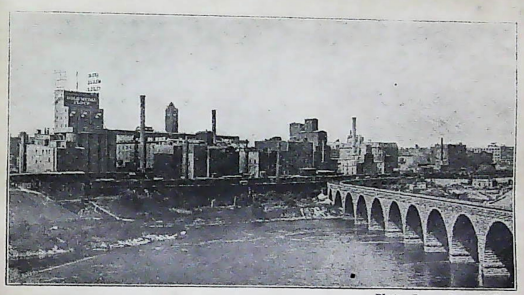


Photo. Brown Bros., N.Y.

FIG. 52.—MINNEAPOLIS.

Note the flour mills and the stone arch bridge (just below the St. Anthony Falls).

Cincinnati and **Louisville** were for many years dependent on the trade that followed the Ohio; now they depend largely on the farming country that surrounds them and on the railways running east and west. Both are connected with the meat-packing industry.

The skins of the animals slaughtered in Cincinnati are turned into leather; hence saddlery, boots and shoes, trunks, and fancy leather articles, are all manufactured; the fat is used for soap-making, now one of the most important industries in Cincinnati. There are also factories for clothing, furniture, and electrical machinery.

Louisville makes agricultural implements and has a great market for tobacco.

Omaha and **Jefferson City**, on the Missouri, are prairie towns; the railways running east and west carry more merchandise than the river boats. Omaha was once noted for silver-smelting, but now meat-packing is more important.

Kansas City, near the junction of the River Kansas and Missouri, is the meeting place of many railways. Meat-

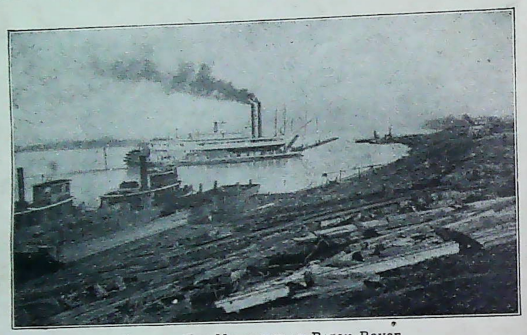


FIG. 53.—THE MISSISSIPPI AT BATON ROUGE.
Note the river boat with paddle at the stern.

packing is the chief industry; lumber from the west is brought to Kansas City for sale and distribution.

Between St. Louis and New Orleans the chief settlements are at points on the Mississippi where the swinging river touches the bluffs on one side or the other. On the east side **Memphis**, **Vicksburg**, **Natchez** and **Baton Rouge** are on such bluffs above the level of flood water. **Helena** in Arkansas is on a bluff on the west side of the river, but the town is only of local importance.

New Orleans, is the commercial metropolis of the Southern States; it is the chief cotton market of the United States,

and it is one of the largest lumber ports. New Orleans is a seaport, a river port, a canal port, and a great railway centre. The town is situated below the level of the Mississippi; hence the soil is damp and the climate is unhealthy. The population consists largely of people of French descent because of the original settlement; many Italian immigrants settle in the town and district, and the coloured population is very large.

EXERCISES.

1. State the position and importance of: New Orleans, St. Louis, Minneapolis, Cincinnati, Kansas City.

2. Where are the prairie lands? Describe the prairies as regards soil and productions.

3. Compare the course of the Mississippi above St. Louis with that of the Missouri.

4. Explain the following terms in connection with the Mississippi: bluff, cut-off, bayou, passes, snags, levées.

5. How is it that railways now carry much of the traffic that once went down the Rivers Ohio and Mississippi?

6. PRODUCTION OF CEREALS IN THE UNITED STATES.

Crop.	1000 bushels.	Crop.	1000 bushels.
Wheat, - -	747,125	Barley, - -	181,030
Maize, - -	2,829,310	Rye, - -	36,710
Oats, - -	1,136,310	Rice, - -	24,380

In what parts of the United States are the above cereals grown? Describe the conditions which suit the cultivation of wheat, maize and rice respectively? State the uses to which maize is put.

LESSON XIX.

THE GULF PLAIN AND THE COTTON BELT.

1. The most important cotton-growing States are given in the subjoined table, together with the average quantity of cotton produced in each State. A bale of cotton weighs 450-500 lbs.

CHIEF COTTON-GROWING STATES.

States.	1000 bales.	States.	1000 bales.
Texas, - - -	3,743	Arkansas, - -	899
Georgia, - - -	2,289	North Carolina, -	833
Mississippi, - -	1,226	Oklahoma, - -	931
Alabama, - - -	1,446	Tennessee, - -	366
South Carolina, -	1,366	Florida, - - -	69
Louisiana, - -	345	Total for U.S., -	13,843

On a map of the Southern States, (*a*) print the names of the cotton-growing States.

(*b*) Shade darkly those States which produce more than a million bales a year, and shade the remaining cotton States very lightly.

(*c*) Mark and name the chief seaports from which raw cotton is exported.

2. Draw a large sketch map of Florida, and mark on it the chief features mentioned in the description (pp. 138-9).

The Coastal Plain.—The Coastal Plain of the Gulf of Mexico consists of (*a*) the peninsula of Florida, (*b*) parts of Alabama and Texas in which there is some variety of relief, and (*c*) the flood plain of the Mississippi in the States of Louisiana and Mississippi.

Florida.—Florida is a low-lying peninsula formed by an upheaval of the sea-floor, but no elevation exceeds three hundred feet. The northern part is composed of **limestone**, and consequently many streams disappear and flow in underground channels. In certain districts there are valuable **phosphate** deposits derived largely from the bones of marine creatures; these phosphates are of commercial value as fertilisers.

The southern part includes large areas known as *everglades*; they are low marshy districts overgrown with tall reedy grass. The eastern coast is fringed with sand reefs enclosing lagoons. At the southern end of the peninsula is a series of coral islands known as *keys*. **Key West**, a naval station for the United States navy, is situated on one of these islands. On the western coast there are fewer reefs, but mangrove swamps extend far into the shallow water.

The sub-tropical climate of Florida is very suitable for the cultivation of oranges, citrons, pine-apples, and other fruits; but at times severe frosts destroy the fruit crops. Cotton, sugar-cane, and maize, are all grown; but forest products, viz. pitch pine, resin, and turpentine, are the most valuable exports, especially from **Pensacola**. **Jacksonville** is the capital of Florida; **Fernandina** is one of the largest fishing ports in the United States, blue fish being shipped to New York in large quantities. Florida is used as a sanatorium for invalids from the Northern States, especially in the winter season.

Alabama.—This state consists of a forest belt of pines in the south; in the centre of the State is a fertile plain (the Black belt) enclosed by the **Chunnenugga Ridge**. Cotton is grown extensively on this plain, and **Montgomery**, the capital of the State, is an important cotton centre.

Birmingham, the largest town in Alabama, is the centre of a coal and iron district. **Mobile** is the most thriving port on the Gulf of Mexico east of New Orleans.

Mississippi.—Half of this State is under forest, the most densely covered area being the **Yazoo delta**. This low-lying alluvial district lies between the Yazoo and the Mississippi; it was subject to frequent inundations until protected by levées. The chief trees in this State are pine, oak, cypress and black walnut. In the central part of the State agriculture is the chief occupation of the people; cotton, maize and fruit are grown. More than fifty per cent. of the population is coloured, a larger proportion of coloured people than any other State.

Louisiana.—Louisiana may be divided into two parts, (*a*) the uplands in the interior, the highest point of which is about 450 feet, and (*b*) the alluvial and swamp regions of the coast. The Mississippi delta occupies about one-third of the total area of the State. Sugar-cane and rice are grown on the coast

area; cotton, maize and fruits are important crops, and large districts are covered with forests. The only mineral in the State is rock salt, found in great quantities on Avery's Island. The **Caddo oilfields**, near Shreveport, are very productive, and most of the oil is taken to **Baton Rouge**, from which port it is exported in tank steamers. Although the summers in Louisiana are long and hot, the winters are more severe than in corresponding latitudes, because of the cold north winds which blow down the Mississippi valley.

New Orleans, the largest town on the coastal plain, is situated on the delta of the Mississippi.

Texas.—The coast-line is fringed with reefs separated from the mainland by lagoons; because of the weak tides the reefs continue in long unbroken stretches with only a few inlets. On the alluvial coast belt, sugar and rice are cultivated and cattle are raised. Towards the interior the surface rises slowly to a dissected hill country with some trees; then follows a terrace of rich rolling land, known as the prairie belt, in which cotton is grown extensively.

Austin, the capital of Texas, is the chief centre of the cotton district. Beyond this is a farming area, and towards the north and west the land rises to the arid **Llano Estacado** and the foot-hills of the Rocky Mountains.

Texas is now the leading State both for the production and exportation of cotton. **Galveston**, situated on a reef, has an enormous export trade, but the import trade is very small. **Texas City** and **Bolivar**, the outports of Galveston, export timber. **Houston**, connected with Galveston by a ship canal, is an important railway centre.

The Cotton Belt.—This belt stretches right across the Southern States from Texas to Carolina. Cotton cannot be cultivated north of the belt shown in Fig. 54 because of autumn frosts. The best known kinds of cotton are:

(*a*) **Sea Island cotton**, grown on the coast belt of Georgia and South Carolina and on the islands off the coasts of these States; this cotton is very strong and fine, and it is noted for its long staple (2-2½ inches).

(*b*) **Upland cotton**, grown on the low hills which extend westward to the Mississippi valley.

In the United States it is found to be more profitable to sow new seeds every year; during the winter the soil is prepared with artificial manures,[1] and the sowing takes place in March or April. In Texas, the cotton-picking usually begins in the month of August; further north, the time of picking gets later, but by the end of the year the whole crop has been gathered.

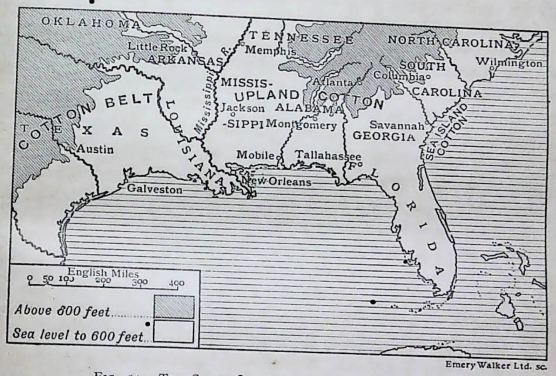


FIG. 54.—THE SOUTHERN STATES AND THE COTTON BELT.

After the cotton has been picked, the seeds are separated from the wool or fibre by means of a machine called a *saw-gin*. From one hundred pounds of picked cotton about thirty-four pounds of fibre, and sixty-six pounds of seed are obtained. The fibre is the raw cotton of commerce, and it is pressed tightly into bales, each weighing about 450-500 pounds. From September to January bales of cotton are being shipped at American ports; the chief of these ports are Galveston,

[1] The best fertilizer is the cake which remains after the oil has been crushed out of the cotton seed.

New Orleans, Savannah, Norfolk, Wilmington, Mobile, and Charleston.

Slavery.—Slaves were first held in Virginia and in Carolina, but the cotton belt in the coastal plain on the south became the stronghold of the wealthy slave-owners. In Virginia the masters, as a rule, lived on the tobacco plantations, where the slaves worked; but in the cotton belt of the south the owners often left the management of their plantations to overseers, who treated the slaves with great cruelty. As most of the arable land of the Southern States was used for the cultivation of cotton, sugar and rice the population was distributed, and great cities did not grow up. Since the war between North and South, which resulted in the **Abolition of Slavery** in 1865, many cities have grown rapidly into important centres of industry, *e.g.* Birmingham, Chattanooga, Columbia, Atlanta, and many others; even now, however (except New Orleans), there is, south of latitude 36°, hardly a city in the United States of more than a hundred thousand inhabitants.

Agriculture is still the most important industry of the south, and the work on the plantations is still done by negro labour, but great changes have been made in the last fifty years. Whatever crop can be raised north of the Ohio can be grown with greater success in the south because of the fertile soil and warm climate. Cotton, maize, wheat, rice, sugar, fruit are produced in enormous quantities.

The wealth of the South does not depend on these crops alone; there are in addition large reserves of timber, and iron and coal are worked in the Southern Appalachians; phosphates are obtained in Florida and Carolina; petroleum and rock salt in Louisiana; stock-raising in Texas, etc. Water-power is also available in the Southern Appalachians.

Cotton Factories.—One important result of the development of the South has been the establishment of cotton factories on the cotton-growing belt. In Carolina, Georgia and Alabama cotton mills already compete with the older factories of New England. The streams of the Southern

Appalachians provide water-power. Coal is plentiful in the Birmingham district, but there is a lack of skilled operatives. In course of time the negro population will probably be trained to work in the factories. The fabrics made in these mills will supply the needs of the South, and hence will be saved the cost of transporting the raw material to New England and of bringing the manufactured goods from New England back again to the cities of the South.

EXERCISES.

1. Describe the coast-line of the Gulf of Mexico from Florida to the Rio Grande.

2. Write notes on Florida, Louisiana, and Texas respectively, with special reference to physical features, climate, and productions.

3. State the position and importance of: Galveston, Pensacola, Key West, New Orleans.

4. What is meant by (*a*) the cotton belt, (*b*) sea-island cotton, (*c*) upland cotton?

5. Describe a cotton plantation and the work done upon it. What happens to the cotton after it has been picked?

6. Say what you know of slavery in connection with the Southern States of America.
In what circumstances were the slaves set free? Why is the problem of the negro population so difficult a matter at the present time in the United States? Refer to p. 73 for the number of coloured people in the United States.

7. What advantages do the Southern States offer for the manufacture of cotton goods? Mention the chief centres of manufacture.

LESSON XX.

THE GREAT PLAINS AND ROCKY MOUNTAINS.

1. Draw a sketch map of the Rocky Mountains in the United States. Name the chief heights, passes and towns.

2. Write in tabular form the various parts of the Great Plains; opposite each, write the name of the State in which it is situated and one river which crosses it.

The Great Plains.—From long. 97° west to the base of the Rocky Mountains, the Great Plains rise from the 1,200 foot contour line to a height of nearly 5,000 feet. The eastern boundary of the plains roughly follows the line of 20 inches of rainfall. On the prairie lands to the east of this line the rainfall is sufficient for crops, but on the plains to the west of the line crops cannot be raised without irrigation. From Texas in the south, the Great Plains extend northwards across the international boundary into Canada. The surface of the plains is very broken, since numerous rivers and their tributaries have cut deep valleys. The plains are treeless, but they are covered with grass on which large herds of cattle are pastured; owing to the small rainfall, cattle require a greater grazing area than on the prairies. On the uplands agriculture cannot be carried on; in the valleys, however, where irrigation is possible, good harvests can be obtained.

Some parts of this region have special characteristics.

(1) **The Plateau** of the Missouri Heights is in North and South Dakota. This district forms a broad upland covered with morainic deposits; the stony surface is unsuitable for ploughing, but yields sparse pasturage. In winter fierce snowstorms sweep over the plateau.

(2) **The Black Hills,** on the border of South Dakota and Wyoming, rise like an island from the plains to a height of over seven thousand feet, Harvey Peak being the highest point. The hills are well forested with pine trees (hence their black appearance), and lumbering gives employment to many people. There are also some gold and silver mines in the Black Hills.

(3) **The Bad Lands** are situated between the North Platte River and the Black Hills. The surface consists of soil of very fine texture, and, on account of the dry climate, grass cannot grow except in the hollows. Sand dunes are heaped up by the wind, and are constantly changing their shape and size. Small streams carve out valleys as they cross the district, and so travelling is difficult because of the numerous ascents and descents; hence the French name, *mauvaises terres pour traverser*. A railway now crosses the Bad Lands.

(4) **Llano Estacado** (the staked plain) is an even-topped plateau on the borders of Texas and New Mexico. On the west it is separated from the Rocky Mountains by the **Pecos Valley**, and on the north it is separated by the Canadian Valley from the High Plains of Colorado and Kansas. Towards the south-east an irregular escarpment 500-800 feet in height overlooks the lower lands of Central Texas.

The plateau is very hot and almost too dry for pasturage; rain does fall in small quantities, but it is of little use for crops. Both storage of water and irrigation are necessary.

Towns.—**Denver** in Colorado is situated on Cherry Creek near the South Platte River, about a dozen miles from the Rocky Mountains. It is the only important city on the Great Plains. In the early days Denver became a resort of men who came up the valleys of the Platte, Kansas, or other rivers on their way to the gold and silver mines in the Rocky Mountains; the miners came to Denver to sell their ores and to purchase supplies. The plains which surround Denver are now used as cattle ranches, or as irrigated farms. The present prosperity of Denver depends largely on railways; from the east many railways focus on Denver, while from Wyoming on the north to New Mexico on the south, the line of traffic follows the eastern base of the Rocky Mountains. A new railroad from Denver to Salt Lake crosses the divide at an elevation of 11,600 feet; it runs through a district which contains bituminous coal, anthracite and petroleum.

Pueblo, on the Arkansas, commands a pass in the Rocky Mountains a little south of Pike's Peak; coal and metal ores are found in the neighbourhood.

Colorado Springs is a health resort on account of its high position and the dryness of the air. Pike's Peak towers up above the town.

The Rocky Mountains.—These mountains extend through

the States of New Mexico, Colorado, Wyoming and Montana. They consist chiefly of an axis of crystalline rocks with horizontal strata merging into the Great Plains on the east and into the plateaux on the west. In New Mexico the main range has an elevation of about twelve thousand feet; in Colorado the range becomes higher and includes **Pike's Peak** and **Long's Peak** (both called after men who explored this part of the Rocky Mountains at the beginning of the nineteenth century). In this section a series of ranges gives a breadth of three hundred miles. In Wyoming the mountains decrease in width and height; the Union Pacific Railway crosses **Evan's Pass** at a comparatively low elevation. North of this, the mountains rise boldly once more into prominent ridges and heights (*e.g.* Freemont's Peak), and on the mountains in Montana there are snowfields and glaciers.

Viewed from the Great Plains on the east, the Rocky Mountains are not very impressive as regards height, because the Plains are 5,000-6,000 feet above sea-level. From a distance the mountains generally appear to be rounded in form with waste-covered slopes on which little snow is seen except in winter; the middle and lower slopes are forested in many sections of the ranges, and in some parts the slopes are treeless, due either to devastating fires or (in the south) to lack of rain.

Mining is an important industry in the Rocky Mountains, gold, silver, lead, and copper being the chief ores obtained. Among the numerous mining centres may be mentioned **Cripple Creek, Leadville, Butte.**

Intermont Basins.—Between the various ranges of the Rocky Mountains are many broad surfaces almost enclosed by the surrounding heights; in some cases they are covered with rock-waste to a depth of a thousand feet. The rivers which flow across these basins escape in gorges or canyons so narrow and steep that they are useless for roads and difficult for railroads. In most of these park-like basins there is sufficient pasturage for cattle.

The following are well-known examples of Intermont Basins:

(1) **San Luis Valley**, in New Mexico and Southern Colorado, is a basin sixty miles long; the larger streams which cross the basin unite with the Rio Grande, but many small streams flow from the surrounding hills and lose themselves in the sand and gravel which cover the floor of the plain.

(2) **The South Park** lies to the west of Pike's Peak, and is one of the highest basins (10,000 ft.); it is drained by the South Platte, and the rainfall is sufficient to support the growth of pine trees.

A. G. Ogilvie, Geo. Jour.

FIG. 55.—UPPER GEYSER BASIN, YELLOWSTONE PARK.

(3) **The Laramie Plain**, drained by the North Platte River and the Green River, is the largest intermont basin; it is traversed for two hundred and fifty miles from east to west by the Union Pacific Railway.

(4) **The Yellowstone Park**, in north-west Wyoming, comprises an area nearly as large as Yorkshire. The scenery is picturesque and varied in character—snow-clad peaks, pine-covered hills, waterfalls, and gorges; the chief feature, however, is a volcanic area in which are lava beds, numerous geysers, hot springs, and dissected volcanoes. This basin has been reserved as a **National Park.**

EXERCISES.

1. Describe the Rocky Mountains, and note the position of the most important peaks.

2. What is an intermont basin? Give three examples, stating the position of each.

3. Compare the plateau of the Missouri Heights with the Llano Estacado.

4. Say what you know of the occupations of the people who live on (*a*) the Great Plains, (*b*) the Rocky Mountains.

5. Explain the following names: Bad Lands, Pike's Peak, Black Hills.

6. State the position and importance of: Colorado Springs, Denver, Cripple Creek, Pueblo.

LESSON XXI.

THE WESTERN PLATEAUX AND PACIFIC BORDERLAND.

1. Draw a sketch map of that part of the United States which lies west of the Rocky Mountains. On it mark the chief river courses, mountain ranges and lakes. Shade the areas of continental (or inland) drainage.

2. From the description in this lesson, find the chief districts for the following products, and write the answer in tabular form: (*a*) timber, (*b*) wine, (*c*) fruit, (*d*) cereals, (*e*) gold, (*f*) petroleum, (*g*) alkali.

3. Draw a map of the Pacific coast of the United States. Name the chief harbours and seaports. Enter on the map the most important articles imported and exported from these ports.

4. Measure in miles the distance from San Francisco to New York, (*a*) by railway, (*b*) by sea (*via* the Panama Canal), (*c*) by sea (*via* Magellan Strait).

5. On a map of North America, find the area bounded by latitude 30° N. and 50° N., and by longitude 110° W. and 130° W. On transparent paper trace the coast-line, the rivers and lines of latitude and longitude which fall within

the given boundaries. Mark the position of San Francisco, and through this position draw lines to show directions due north and south, due east and west. Also write the latitude and longitude of San Francisco.

The Western Plateaux.—The North-Western Plateau, a large area in the States of Idaho, Oregon and Washington, is crossed by the Rivers Snake and Salmon. The surface of the plateau consists chiefly of lava; at various periods lava floods spread over the plain and surrounded many isolated hills which now stand like islands on the lava plain. Rivers have cut deep gorges or canyons in the lava, and in some cases they have laid bare the underlying rocks; the canyon of the **Snake River** is four thousand feet deep. Vegetation on the plateau is somewhat sparse owing to the scanty rainfall; sage bush grows everywhere and grass suitable for horses and cattle grows in various districts. In the eastern part of the plateau near the Rocky Mountains wheat is grown because of the heavier rainfall and richer soil; in many districts, however, irrigation is necessary.

Spokane is at the junction of two transcontinental railways.

Butte and **Bozeman** are mining centres for copper, lead, silver and iron.

The Colorado Basin.—The plateau, crossed by the upper branches of the Colorado River, is enclosed on three sides by mountain ranges, viz. the Rocky, Uinta and Wahsatch Mountains, but it is open on the south. The **Uinta Mountains** run east and west; they were formed by an uplifting of the strata into an arched position, the ridge being eleven thousand feet high. The **Green River**, which rises in Wyoming, has cut a sinuous gorge through the Uinta Mountains.

The plateau, about seven thousand feet in height, is formed of horizontal strata, and in many parts the surface consists of lava beds broken by deep fissures. In many cases the fissures have been deepened still further by the rivers which flow in them, thus forming the canyons for which the region is noted. The **Grand Canyon** of the Colorado (Fig. 56) is the most wonderful example of this kind of river valley; the

river is more than a mile below the level of the surrounding country.

In the northern part of the plateau the rainfall is sufficient

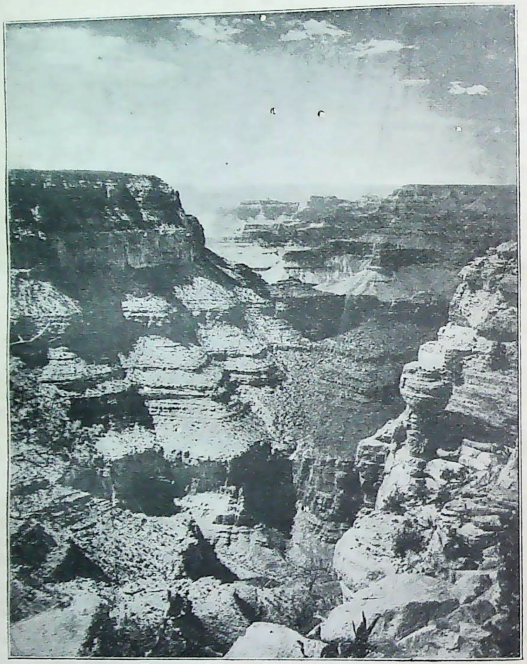


FIG. 56.—GRAND CANYON, COLORADO

for trees and grass; to the south in New Mexico and Arizona, the elevation decreases, and the lack of rain turns the land into a barren desert. The annual rainfall at Phoenix is only five inches. Not much use has yet been made of the Colorado

for irrigation because of the canyons, but the waters of its tributary the Gila have been used to turn a desert into fertile land, producing tropical fruits. The date-palm thrives in this valley, as it requires plenty of water about its roots, a hot dry atmosphere for its foliage, while alkaline soils do not injure it.

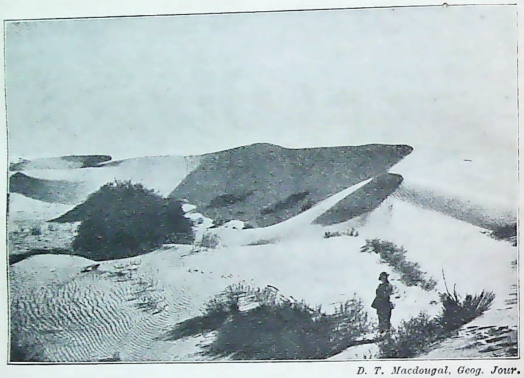
The Great Basin.—This region stretches from the Wahsatch Mountains to the Sierra Nevada, and it includes Western Utah and the whole of Nevada.

The **Wahsatch Mountains** rise boldly from the Great Basin, and appear as an imposing range of mountains. The **Great Salt Lake**, now less than fifty feet deep, represents a great lake which once filled the basin to a depth of more than a thousand feet. This ancient lake was as large as the present Lake Huron, and its outflow was carried off by the Snake River, but waste from the uplands was deposited on the bed of the lake. In consequence of the climate of the region becoming warmer and drier, the lake was reduced in size, the uncovered bed remained as mud plains and the outflow to the ocean ceased. Hence these plains are now a region of **continental drainage**, that is, instead of flowing to the sea, the rivers either enter salt lakes (as in the case of the Great Salt Lake), or they lose themselves in the permeable soils of the plain. The rain which falls on the mountains around the basin supplies the rivers with water; great evaporation, however, takes place over the whole basin, hence irrigation is necessary for crops. Large numbers of sheep and cattle are pastured in Utah, the eastern part of the basin. Most of the people live along the streams which flow from the Wahsatch Mountains. A few hill ranges run from north to south across the basin, some of which have trees upon them.

Salt Lake City, on the River Jordan, is eleven miles from the Great Salt Lake. A religious sect called Mormons settled here in 1846, and by industry and perseverance they established a city which has become prosperous, and they made the surrounding district fertile by means of irrigation. Salt Lake City is now the capital of the State of Utah.

Ogden, to the north of Salt Lake City, is an important railway junction; the Union Pacific Railway passes through it.

The western part of the Great Basin in Nevada contains numerous **alkaline flats** in which streams disappear. In this region the conditions are more unsuitable to human occupation than any other part of the United States. In Southern Nevada the elevation of the country decreases, and in one



D. T. Macdougal, Geog. Jour.

FIG. 57.—GYPSUM DUNES FORMED FROM THE DEPOSIT IN A LAKE BED, OTERO BASIN, NEW MEXICO.

Gypsum or sulphate of lime is also known as plaster of Paris.

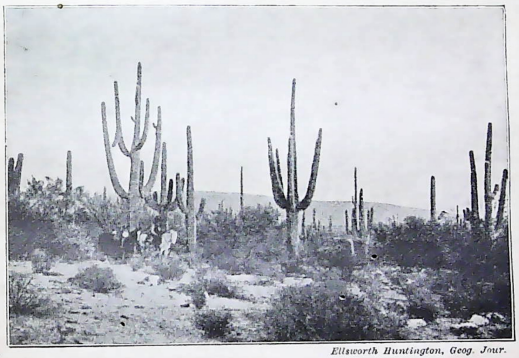
district it is below sea-level. The land is practically desert except where irrigation can be practised.

Virginia City became important for a short time during a mining boom, but its prosperity has gone.

The Pacific Borderland.—On the Pacific borderland two ranges of mountains, separated by broad valleys, run parallel with the coast-line. (1) The mountains facing the sea are known in California as the **Coast Range**, in Oregon as the **Klamath Mountains** and in Washington as the **Olympic**

Mountains. The most important gaps in the Coast Range are (*a*) the **Golden Gate**—the entrance to the most spacious and best sheltered harbour on the Pacific side of the United States—and (*b*) the estuary of the River Columbia.

(2) The **Sierra Nevada** and the **Cascade Range** are more lofty than the Coast Range; they rise boldly and steeply from the Great Basin, but the western slope is gentle and the foothills merge into the plain; hence short rivers of little volume



Ellsworth Huntington, Geog. Jour.

FIG. 58.—FOREST OF GIANT CACTUS IN THE SANTA CRUZ VALLEY, NEAR TUCSON, ARIZONA.

reach the salt plains of Nevada, but numerous streams flow down into the **Sacramento** and **San Joaquin**. The **Yosemite Valley**, a cleft in the Sierra Nevada, is noted for its perpendicular granite cliffs which enclose the valley and for a series of picturesque waterfalls. Several peaks in the Sierra Nevada exceed 14,000 feet in height, *e.g.* **Lyell**, **Tyndall**, and **Whitney**; while the lofty peaks of the Cascade Range are volcanic cones (**Shasta**, **Hood**, **Rainier**, etc.), the summits of which are covered with snow and ice, the lower slopes with dark green forests. The Sierras are rich in veins of gold;

at first, particles of gold washed down from the mountains were obtained by washing the gravels in the beds of the streams; now gold quartz is taken to the stamp-mills, where it is crushed in order to separate the metal from the rock. Gold mining attracted men from the Eastern States, and so helped greatly in the development of the west. Agriculture, however, is now the leading industry of California.

Between the Sierras and the Coast Ranges there is a wide valley, but it is divided into three parts by transverse ridges; in California it is called the **Great Valley**, in Oregon the **Willamette Valley**, and in Washington the **Puget Sound Basin**. The Great Valley, nearly five hundred miles long, is drained by the Rivers Sacramento and San Joaquin; these rivers unite and enter the sea by the Golden Gate. The floor of the Great Valley is covered with alluvial soil which has been brought by the rivers from the sierras, and in this fertile soil many crops are grown.

California.—In California the climate is of the Mediterranean type, and hence there are warm, wet winters and hot, dry summers. This climate suits the growth of the vine, oranges, cereals, hops, beet, and many other crops. **Fruit growing** is steadily taking the place of grain; fresh fruit is now sent from California to all parts of the United States in cars specially constructed with cool chambers. Canned and dried fruit are exported. Most of the wine made in California is used in the United States, but some is sent to Great Britain.

Lumbering.—The chief trees are red wood, spruce, Douglas fir, cedar, hemlock and others; large quantities of timber are exported. Except in the large towns the houses in California are built entirely of wood. The inferior kinds of wood are used for making packing-cases and boxes for fruit and wine.

There is no coal in California. **Petroleum** is the most valuable mineral product; it is used on coasting steamers, in factories, and for inland traffic.

Hydro-electric Work.—The snows on the high mountain ranges in California melt in summer when water is most

needed for irrigation. Many streams provide water power for the generation of electricity, and after running through the turbines, the water is used for irrigation. The electricity thus obtained at low cost supplies power and light for tramways and factories in the towns where fuel is scarce; and, where necessary, the electric power is also used for pumping irrigation water on to the dry land.

Towns.—**San Francisco** takes its name from a mission founded by priests from Mexico in 1776; it became an American city in 1846, and the population then was only five hundred people. Two years later gold was discovered in California, and this brought prosperity to San Francisco. The city stands at the end of a peninsula with the ocean on one side and a bay on the other; the entrance to the bay is called the Golden Gate, a channel five miles long and one mile broad.

Trade and human movement seem to focus on the Golden Gate; steamers from San Francisco trade especially with Japan, China, Hawaii and Europe, while coasting trade is carried on with the various ports on the Pacific coast of America. People belonging to many nationalities are found in San Francisco; a large number of Chinese occupy a separate quarter of the city.

Oakland, on the eastern shore of San Francisco Bay, is the terminus of the Southern Pacific Railway. **Sacramento**, the capital of California, is situated in the fertile valley of the Sacramento River.

Los Angeles, in Southern California, includes the port of Wilmington. The trade of the district is at present carried on chiefly by rail, but docks are being built to accommodate large steamers from the Panama Canal route. The population of Los Angeles now exceeds that of San Francisco. The surrounding districts are very productive; oranges, lemons, and wine are grown extensively; at **Wineville** there are at least twenty thousand acres of vineyards. Cotton is grown in the **Imperial Valley**; sugar-beet is cultivated, and sugar is prepared in several factories. Petroleum is pumped from wells in Southern California, and gold is mined at **Randsburg**.

San Diego, near the border of Mexico, has a small amount of coasting trade; near San Diego wine, fruit, and dairy produce are obtained.

The Columbia River.—This river rises in British Columbia, and in its lower course forms the boundary between Oregon and Washington. The navigation of the river is obstructed by falls and rapids, but canals are being constructed to make the river navigable for four hundred miles from the mouth. Ships are often unable to enter the estuary because of a surf-beaten bar. Salmon abound in the Columbia, and many canneries have been established at Portland, Astoria and other places.

Portland, the chief city of Oregon, is on the Willamette River. In the fertile Willamette valley cereals (especially wheat and oats), apples, pears and other fruits are grown; timber and canned fish are the principal exports.

Astoria, at the mouth of the Columbia, was founded in 1811 by the Pacific Fur Company. It is now an outport of Portland.

Puget Sound.—This is an inland sea joined to the Pacific by the Admiralty Inlet and Juan de Fuca Strait. The numerous branches of Puget Sound are navigable for large vessels; the only cargoes available at the various ports are lumber, grain, canned fish and fruit. As the population of the State of Washington is small, the demand for manufactured articles from abroad is not great. Many imported articles come from Japan, and most of them are sent on direct to the Eastern States.

Seattle, on Elliott Bay, an arm of Puget Sound, is by far the largest town in Washington, and it has great trade with foreign countries. Steamers, belonging to the C.P.R., ply between Seattle and Canadian ports; there is also considerable trade with Alaska. Seattle has a shipbuilding industry, and is a station for the United States navy.

Tacoma is the second port of Washington. Great coal deposits underlie the Puget Sound Basin, and Roslyn is the chief coal-mining centre; in consequence of this, copper ore from British Columbia, Alaska, Idaho and other districts is brought to Tacoma for smelting. Another important industry is creosoting blocks to be used for paving, for piles and for building materials.

Bellingham, Everett and **Olympia** are less important ports on Puget Sound.

EXERCISES.

1. Compare the course of the Snake River with that of the Green River. Of what rivers are they tributaries?

2. Write notes on the following mountain ranges: Wahsatch, Uinta, Nevada, Cascade.

3. Describe the Great Basin, and mention the chief occupations of the people.

4. Why are there so many salt lakes in the states of Utah and Nevada?

5. Say what you know of: the Golden Gate, Yosemite Valley, Puget Sound, Willamette Valley.

6. State the position and importance of: Los Angeles, San Francisco, Portland (Or.), Seattle.

7. Write an account of the State of California as regards climate, natural vegetation and crops. In what parts of California is irrigation carried on? Why is this necessary?

8. Say what you know of gold mining in California. What other minerals are found in California?

9. From a map of North America describe the course of the River Columbia and its tributaries.

10. What towns are situated on Puget Sound? State the trade of each.

LESSON XXII.

ALASKA.

1. Draw a map of Alaska. On it mark the gold-mining districts and the routes by which they are approached.

2. Measure the distance from Seattle to Dawson City (*a*) *via* Skagway, (*b*) *via* Bering Sea and the Yukon.

3. Measure (in miles), (*a*) the distance across Bering Strait from Alaska to Asia, (*b*) the distance from the Arctic Ocean to the Pacific Ocean along meridian 141° W.

Alaska.—Alaska is bounded on the east by the 141st meridian from the Arctic coast almost to the Pacific coast; a narrow strip which extends as far south as latitude 55° is also included in Alaska.

The southern coast-line is deeply indented with **fjords**;

Photo. Brown Bros., N.Y.

FIG. 59.—RUBY, ALASKA.

these fjords (or drowned valleys) are due to subsidence, and numerous islands protect the navigable channels leading to the fjords.

Parallel to the coast are lofty mountain ranges in which are some of the highest mountains in North America, such as **Mount McKinley, Mount St. Elias** and others. The lower slopes of the range are covered with forests of spruce and cedar, while the higher parts of the mountains are snow-capped. The snow-line is only about two thousand feet above sea-level; many glaciers descend below the snow-line, and in some cases reach the fjords; masses of ice frequently break off from the glaciers and form icebergs.

The **Aleutian Islands** are of volcanic formation; they stretch from the Alaskan peninsula towards Kamchatka.

The interior of Alaska consists of bleak plains about which little is known except the lands near the **River Yukon**. The climate of the interior is very severe, and it presents a striking contrast to the mild conditions on the Pacific coast.

Alaska was purchased from Russia by the United States Government in 1867. The seat of government is at Juneau. It is inhabited by various Indian and Eskimo tribes who get their living by hunting and fishing, and by a few white men chiefly engaged in mining. Reindeer have been introduced from Siberia to increase the wealth of the natives. In 1896 gold was discovered in the **Klondike Valley** in the Canadian Yukon district, and shortly afterwards it was found in other parts of the Yukon basin and at Nome on the west coast. This discovery led to a rush of miners, who first obtained gold by placer mining (that is, by washing the gravels in the streams for gold), but quartz mining is now the usual method of obtaining the ore.

To reach the gold district many men travelled in coasting steamers to the fjords and then crossed the mountains by various trails to the upper waters of streams flowing into the Yukon. The most frequented route was *via* **Skagway**, and along this route a railway has been laid down to the **White Horse Pass**; from this point the traveller can in summer descend the River Lewis by steamer to **Dawson City**.

Another route to the mining district is by the River Yukon, but this is only practicable during the short summer. The Lower Yukon flows across frozen plains known as tundras, and the mouths of the river are obstructed with sand bars; hence boats drawing more than four or five feet of water cannot navigate the Yukon.

Pribilof Islands.—This group of islands in Bering Sea is frequented every summer by seals. American ships visit the islands every year, and large numbers of seals are killed for the sake of their skins.

EXERCISES.

1. Write notes on Alaska under the following headings: climate, fjords, mountains, plains.

2. What islands belong to Alaska? Of what importance are they?

3. Describe the course of the River Yukon.

LESSON XXIII.

GREAT ENGINEERING WORKS.

1. Draw a sketch map to show the railway route from New York to Havana.

2. On a large map measure the distance in miles from Key West to (*a*) Colon, (*b*) New Orleans, (*c*) Georgetown.

3. On a map of the Great Lakes draw two circles (*a*) radius 100 miles with a continuous line, (*b*) radius 500 miles with a broken line. Make a list of the chief places situated within the first circle supplied with water-power from Niagara, and secondly, the most important places within the larger circle.

Overcoming Natural Obstacles.—North America is a continent of enormous size, and everything in nature is seen on a big scale; the people, influenced to some extent by these surroundings, have big ideas, and in developing the resources of the country they have certainly accomplished engineering feats of extraordinary magnitude and difficulty. Great railways, thousands of miles long, connect the Atlantic coast with the Pacific coast in spite of the engineering difficulties presented by the Rocky Mountains. The Panama Canal now provides a water-

way from the Caribbean Sea to the Pacific Ocean, although a mountain range, tropical floods and a deadly climate were serious obstacles. Magnificent bridges have been constructed across rivers, lakes and arms of the sea, such as the Brooklyn Suspension Bridge at New York, the Victoria Railway Bridge at Montreal, and others. Wonderful irrigation works have been made in the Western States, by which large tracts of dry desert land have been brought under cultivation.

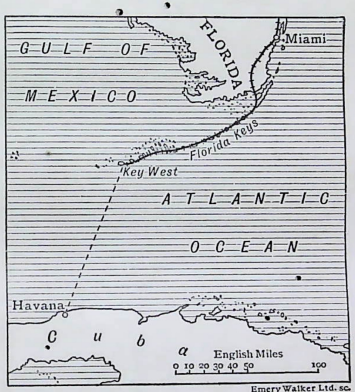


FIG. 60.—FLORIDA EAST COAST RAILWAY EXTENSION.

Many other examples of great engineering feats might be mentioned; the three following examples, two in North America and one in South America, present features of particular interest and striking contrast:

(1) Florida East Coast Railway Extension.

Nowhere else in the world is there a railway which seems to run off a continent right out into the sea, and yet, on looking at Fig. 60, it will be noticed that the railway on the east coast of Florida leaves the land and runs out into the Atlantic until it terminates at a place called **Key West.**

By means of this railway it is now possible to travel from New York to Havana, a distance of nearly 2,000 miles, without getting out of the train, for, when Key West is reached, the train runs on to a ferry-boat and is carried the remaining ninety miles to Havana.

In order to construct the railway from **Miami** in Florida

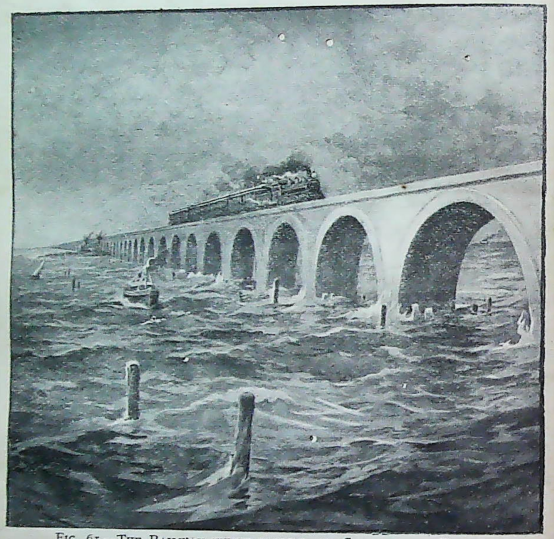


FIG. 61.—THE RAILWAY WHICH CROSSES THE SEA BETWEEN FLORIDA AND KEY WEST.

to Key West (a distance of 156 miles) advantage was taken of the long line of palm-covered coral islands which form a series of stepping-stones; these islands are called *keys*, and the railway crosses forty-seven of them. Between the islands the water channels varied from a few yards to six miles in width and to forty feet in depth. Where the channels

were narrow and not deep, embankments made of concrete, stone and steel were raised from the sea-bed; in the case of the wide channels, embankments were run out as far as possible from the two sides and then joined together by viaducts or bridges, the arches of which rested on concrete piers. After a long series of observations it was found that the highest waves in the adjacent seas did not rise more than twenty-five feet; hence the embankments were made to a height of thirty feet above high-water level. Nearly all the work in constructing the railway was done from ships and boats. There is only a single line of railway along the embankment, but the work cost twenty thousand pounds a mile. A little more than a hundred miles from Miami is a railway station called **Marathon**, where a dock has been built.

Key West, an important base for the United States navy, is the nearest naval station to Cuba and the Panama Canal; since the opening of the railway Key West has become a commercial port.

(2) Water-Power at the Niagara Falls.

Long before 1678, when white men first saw the Niagara Falls, the Indians had gazed with fear at the roaring waters; for many years white men visited the Falls only to admire their grandeur and to wonder at their immense size; men still do these things, but they also use the power of the water to generate electricity for lighting houses and streets, for driving tramways and railways, and for many other purposes. The first attempt to use the water-power was in 1725, when a water-wheel was erected at the side of the Falls to work a sawmill; a hundred years later a paper-mill was put up, but it was not until 1881 that the first power-station was built to generate electricity.

It has been calculated that one million tons of water fall over the Niagara cliff every hour; this great volume of water falling one hundred and sixty feet possesses an enormous power of work, and the problem was how to utilise this power without spoiling the natural scenery of the Falls. The problem was solved by taking the water from the Niagara

River a mile before it reaches the Falls; it is made to pass through a huge tunnel built of steel pipes, and then it falls down a vertical pipe to a depth of 180 feet; the power thus gained revolves turbines, or water-wheels, made of steel;

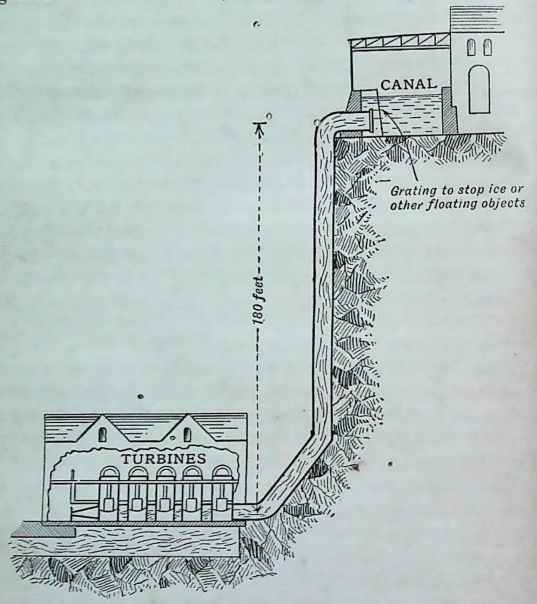


Fig. 62.—Diagram to show how Water-power is used at Niagara.

these wheels are connected with great generators, and the electricity is then conducted by wire cables to the distributing centres.

There are now many power companies with distributing stations on both sides of the river, one of the greatest being the Ontario Power Company. In the works of this company

a great tunnel (or tail race) has been made to carry off the water which has done its work on the turbines; this tunnel extends for a distance of 1,935 feet under the bed of the Niagara River, and finally emerges through the wall of rock over which plunges the Horse Shoe Cataract. This tunnel has become a show place for tourists, although it was not built for that purpose. From the roof of the tunnel a visitors' gallery is suspended; along the floor of the tunnel is the rushing water, and in front of the mouth of the tunnel, but sixty feet from the face of the rock, is the Niagara Fall itself, the intervening space being filled with blinding spray. Within a radius of a hundred miles from Niagara most of the work is done by the power generated at the Falls, and when all the power-stations are in working order, places within a radius of three hundred miles will probably be supplied in the same way. The cables, which transmit the power to Toronto, eighty-eight miles away, are carried on steel towers forty-six feet in height, but where navigable channels are crossed (*e.g.* Welland Canal) the towers are more than one hundred and fifty feet high.

(3) An Aerial Ropeway in the Andes.

Everyone has heard of the mineral wealth of the Andes, and how the Spaniards worked the silver mines of Peru and Bolivia, the gold mines of Colombia and the copper mines of Chile. In most cases the mines were situated many thousands of feet above sea-level, and the chief difficulty was to reach the mines and to bring the ores to the coast. This was usually done by loading the heavy ores on the backs of mules and by driving them along rough tracks on the steep slopes of the mountain sides. This kind of transport was very dangerous and it occupied much time and labour. In some places railways have now been constructed to the mining districts, such as the Oroya Railway in Peru (Fig. 99), an example of wonderful engineering skill. In the following instance, however, another method has been adopted, as it was found that the difficulties were almost insuperable for a railway, while the cost of a mountain railway was prohibitive.

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FIG. 63.—THE AERIAL ROPEWAY UP TO FAMATINA IN THE ANDES.

Note (*a*) the standards on which the cables rest, (*b*) the car hanging from the cable, (*c*) the zig-zag path up the mountain side.

Chilecito in the Argentine is 3,600 feet above sea-level, and it is connected with Buenos Aires by a railway eight hundred miles long. The famous copper mines of **Famatina** in the Andes are 12,250 feet above Chilecito. From Chilecito to Famatina as the crow flies the distance is only twenty-two miles, but by the mule track it took nearly three days to reach the mines. For six months in the year the track was impassable because of snowdrifts; hence an improved method of transport was needed, and an aerial ropeway was decided upon.

Towers, on concrete platforms, were first erected at convenient positions to support the cables; on account of the distance and the varying mountain heights, it was arranged to make the ropeway in eight sections, each section having two separate hauling ropes, one for uphill, the other for downhill traffic. The rope for each section had to be made complete, as it had to work as an endless cable; some of the cables when ready weighed more than two tons; they were stretched out at full length and carried by gangs of men up the track in a snake-like procession until the rope was in position for raising on to the towers. On similar ropeways of short length it is often possible, through the force of gravity, for the empty cars to be hauled up by the descending cars. In this case, however, the different sections varied so much in gradient and the weights varied so much, that steam power was necessary to assist the work in some parts of the line.

The cars hang from the ropes, and they are kept under control by a grip; each car carries about half a ton, and as a rule, forty tons can be hauled downhill every hour. Starting from Chilecito the traveller seems to be swung into mid-air, and he sees beneath him mountain ridges, yawning ravines and gigantic precipices. In four hours he is raised to an elevation of 15,750 feet above sea-level; this elevation is higher than the summit of Mont Blanc, the highest mountain in Europe, and the traveller has passed from the summer conditions of the plain to the winter conditions of the mountain heights.

EXERCISES.

1. Write a list of six great engineering works in America; state the importance of each.

2. Describe the railway from Miami (Florida) to Key West.

3. To what uses has the water-power at Niagara been put? Give other examples of water-power being used in America.

4. Describe the picture on page 166.

5. What advantages does a ropeway possess as a means of communication? What difficulties are there in constructing (*a*) a mountain railway, (*b*) an aerial ropeway?

LESSON XXIV.

ENVIRONMENT.

1. On a map of North America shade with different colours the regions in which the following live: Eskimos, Negroes, Lumbermen.

2. Examine the pictures in this lesson, and from each picture draw a sketch of one feature (*e.g.* an Eskimo's hut).

It is often said that men are influenced by their surroundings or *environment* as regards their habits, occupations and mode of life. The three following examples contrast people living under very different conditions; many other examples might be given from people living on the American continent.

1. **Life in the Tundras.**—The lands on the Arctic coast of North America, the coast of Northern Greenland, and the islands within the Arctic Circle are cold, dreary and inhospitable. In winter there is continuous night illuminated to some extent by the Northern Lights (Aurora Borealis); in summer the sun shines day after day without setting. The sun's rays are very slanting even at midsummer, and so the land does not receive much heat; consequently on elevated land the snow does not melt at all, and on low-lying land the melted snow forms swamps.

The Eskimo,[1] who lives in these northern lands, belongs to the yellow race (Mongol type). He has to obtain his food from the sea by hunting the seal and walrus and by catching fish; because of the intense cold, he eats not only the flesh but also the fat, or blubber. As trees do not grow so far north, the Eskimo has to rely on driftwood washed up by the sea, and from this he makes the framework of his boat and covers it with skin; the boat is called a *kayak*. He uses a harpoon made of driftwood and pointed with walrus

V. Stefansson.

FIG. 64.—ESKIMO HUT AND DOGS

ivory. The Eskimo wraps himself in furs, and in winter he lives either in a snow house, or in a pit covered in with wood, whalebone and earth; in summer, when he is out hunting or fishing, he puts up a tent made of a framework of wood or whale's ribs and covered with skins; this tent can easily be taken down and carried with him on his journeys. The Eskimo is often accompanied by his dogs, who help him by drawing the sledge over the frozen ground.

The conditions under which he lives have made the Eskimo a bold hunter and ready to face dangers, but he is peaceful

[1] The word Eskimo is said to mean "eater of raw flesh"; the people however call themselves Innuits or men.

and hospitable. More frequent intercourse with white men has tended to change some of his primitive habits. Rifles, ammunition, spirits and tobacco are articles eagerly sought after by the men; steel needles and thread by the women.

2. **Life on a Cotton Plantation.**—The life of men in the

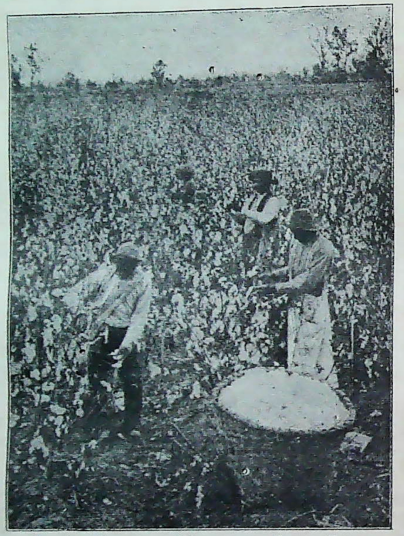


FIG. 65.—NEGROES AT WORK IN THE COTTON FIELDS.

cotton belt of the Southern States of North America presents a great contrast to that of the Eskimo of the Arctic lands. The cotton belt (Fig. 54) is a sub-tropical region in which the climate is hot in summer, as the altitude of the sun is then very high; but it is warm in winter, although frosts do occur occasionally. Abundant rain falls in the summer, making the alluvial soil exceedingly fertile. Under

these conditions men of the black type, whose ancestors lived in tropical Africa, do the field work on the cotton plantations; they are able to work from sunrise to sunset under the hot rays of the sun, preparing the ground, planting the seeds, tending the young plants and picking the cotton. They then work the gins which separate the cotton seeds from the fibre, and pack the raw cotton into bales ready for export. In the days of slavery the negro had to pick so many pounds of cotton a day to escape punishment; now the freed negro works for wages in order to buy the necessaries of life.

During the day the negro wears light cotton garments with bright-coloured patterns, but at night he often requires a blanket, as the temperature falls rapidly after sunset. He lives chiefly on cereals, vegetables, and fruit, and occasionally eats fish and chicken; his house is usually made of wood. Some negroes are now well educated and quite able to perform the duties of citizens, but many are still indolent, unrestrained and superstitious.

3. **Lumbering in Canada.**—Lumbering is done almost entirely by white men. While working in the forest they live in wooden huts or shanties; in the middle of each hut is an open fireplace which is useful for heating the hut and for cooking food. The men sleep in bunks, one above the other, round the sides of the hut. As regards food, they live on the stores brought from the township, and they sometimes supplement this food with fish from the rivers, or animals from the forest.

The pioneers must first clear and level a roadway along which the logs may afterwards be dragged. Throughout the long Canadian winter the ground is deeply covered with snow, and, as the air is dry, the snow becomes hard and smooth. Trees of sufficient girth are blazed or marked, and these the lumbermen proceed to cut down. After determining in which direction a tree is to fall, the men begin to chop deep gashes in the trunk before using the saw. Having trimmed all the branches by means of the axe, the trunk is then sawed into logs varying in length

from twelve to eighteen feet; the logs are then branded with the owner's mark and taken on little sledges along a skidway to the road. The men then drag the logs over the frozen snow to the nearest river, or lake, where the logs are fastened together into rafts, so that they can be floated down the stream as soon as the ice melts. Some of the lumbermen travel on the rafts, using long poles to keep the rafts away

FIG. 66.—HAULING LOGS IN ONTARIO.
(By courtesy of the G.T.R.)

from the banks and to guide them over the rapids. They often erect a little wooden house on the raft in which each man can take his turn to sleep. When the raft reaches the sawmill, usually near a waterfall, the logs are cut into planks by circular saws, and the lumbermen superintend the work day and night during the summer.

The conditions under which they work make these men hardy, rough in manners, but independent and fearless.

EXERCISES.

1. Compare the conditions under which an Eskimo lives with those under which a negro lives.
2. What dangers have to be faced by an Eskimo?
3. Describe a Canadian forest and the work done in it.
4. How is the industry of lumbering assisted by (*a*) snow, (*b*) rivers?

PART III.

MEXICO, CENTRAL AMERICA, WEST INDIES.

LESSON XXV.

MEXICO.

1. On a map of Mexico measure (in miles) :
   (*a*) The distance from the capital to El Paso, Vera Cruz and Acapulco respectively.
   (*b*) The shortest distance across the isthmus of Tehuantepec.
   (*c*) The distance between the Mexican coasts along the Tropic of Cancer.
   (*d*) The length of the northern frontier.

2. The chief articles sent from Mexico to the United Kingdom are given in the table below.
Make a percentage table, and draw a diagram to represent these values. A column ten inches in height should be drawn to represent the value of the total exports.

ARTICLES EXPORTED FROM MEXICO TO UNITED KINGDOM.

Article.	Value in £1000.	Article.	Value in £1000.
Coffee, - - -	83	Silver Ore, - -	565
Sugar, - - -	126	Copper Ore, - -	622
Gold Ore, - -	40	Lead Ore, - -	292
Total Exports, - -	2,227.		

3. Draw a sketch map of Mexico. Mark on it the six largest towns (page 185), the chief seaports, and shade the land which is more than 1,000 feet in height.

4. In the subjoined table the average temperature and rainfall for each month are given :

	Vera Cruz (sea-level).		Mexico City (7,400 ft.).	
	F.	Inches.	F.	Inches.
January, - -	71·4°	0·4	54·0°	0·2
February, - -	73·2	0·6	56·8	0·2
March, - -	74·8	0·6	60·4	0·5
April, - -	79·0	0·1	64·2	0·5
May, - - -	81·0	4·2	64·9	1·9
June, - -	81·5	12·4	63·9	3·9
July, - - -	81·7	14·8	62·4	4·1
August, - -	81·9	8·9	62·0	4·7
September, -	80·4	11·6	61·2	4·1
October, - -	76·5	8·9	58·6	1·8
November, -	74·8	3·2	56·5	0·5
December, -	70·9	2·0	53·4	0·2

Draw a diagram similar to Fig. 71 to represent the temperature and rainfall of Vera Cruz and Mexico City respectively.
Find (*a*) the latitude of each city, (*b*) the total rainfall per annum, (*c*) the average temperature of each.

Mexico.—The republic of Mexico is divided into two geographical regions by the Isthmus of Tehuantepec : (1) the great plateau with mountain ranges on its eastern and western margins stretching northwards to the frontier of the United States ; (2) the highland district which extends from the isthmus to Guatemala, together with the limestone plain of Yucatan.

The peninsula of Lower California, almost separated from the mainland, also forms part of the republic of Mexico.

The Mexican Plateau.—This is bounded on the west by the lofty **Sierra Madre Occidental** (upwards of ten thousand feet in height), the Pacific slopes of which are very steep ; on the east is the **Sierra Madre Oriental**, which forms an escarpment

of the plateau rather than a true mountain range. These sierras are composed largely of old crystalline rocks, and they have an imposing appearance when viewed from the coast lands, but when seen from the plateau their elevation is much less striking.

Near latitude 19° N. a transverse range runs from east to west; the mountains in this range are of volcanic origin, and they are higher than the peaks in the sierras. The highest

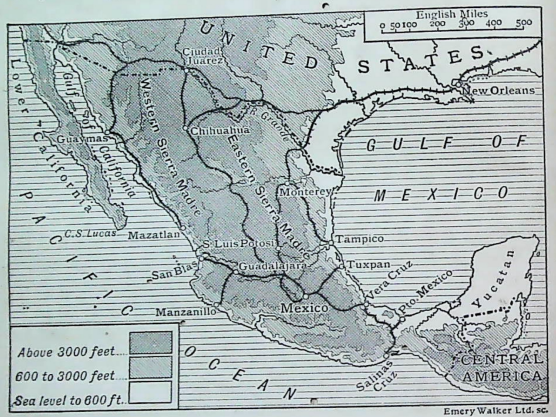


FIG. 67—MEXICO.

summits are **Orizaba** (18,000 ft.), **Popocatapetl** (smoky mountain) and **Ixtaccihuatl** (white woman); these are extinct volcanoes; consequently Popocatapetl no longer "smokes," and the summits of all three are covered with snow because of their great height. Colima and Jorullo are active volcanoes.

Earthquakes often occur in Mexico, but they are most frequent on the Pacific coast.

The surface of the plateau is due to the accumulation of (*a*) deposits worn down from the sierras, (*b*) materials thrown

out from volcanoes. The height of the plateau ranges from 6,000 to 9,000 feet, but in the north the elevation decreases to less than four thousand feet. The uniformity of the plateau is broken by enormous fissures called *barrancas*, which usually extend from east to west; they are often hundreds of feet deep, and are covered with rich vegetation.

Rivers.—Mexico has few rivers because of the configuration of the country, the slight rainfall on the plateau, and rapid evaporation. The rivers that reach the sea are either impetuous mountain torrents, or they have cut their way from the plateau through gorges in the sierras to the narrow coastal plains. Very few are of any use for navigation.

The Rio Grande del Norte (great river of the north) rises in the United States; in Colorado and New Mexico its upper waters are tapped for irrigation; the river flows through wild gorges, and it has many swirling rapids as it forces its way from the highlands to the coast. It is navigable for small vessels for about a hundred miles from its mouth. In the dry season the main stream becomes shallow, while its tributaries from Mexico dry up; after the rains these tributaries become sluggish saline streams.

The Panuco (Tampico) has a precipitous course in its passage through the sierra, and it brings down much sediment which helps to enclose the lagoons near its mouth. The largest river on the Pacific side is the **Rio Grande de Santiago** (Lerma); it flows through Lake Chapala on the plateau, and it has many waterfalls in its course; it is not navigable at any time of the year.

Enclosed Basins.—On the plateau are several basins which have no outlet to the sea; the most important is the Valley of Mexico or Anahuac (Anal-huatl = amid the waters). In this basin are six small shallow lakes now representing an inland sea which in former times filled the whole valley (having an area of more than two thousand square miles), and probably was drained by the Rio Panuco to the Gulf of Mexico. A gradual change of climate reduced the lake in size until it ceased to have an outlet. The Aztecs,

who inhabited the valley at the time of the Spanish Conquest, had founded their capital on an island in Lake Texcuco; this salt lake occupied the lowest part of the depression, and into it came the overflow from the other lakes. Although the city of Mexico now occupies the same site as the Aztec capital, it is no longer surrounded by water, as the lake has shrunk and is now two miles and a half from the city.

Climate and Vegetation.—Mexico stretches across eighteen degrees of latitude, and it is crossed by the Tropic of Cancer; the southern part of the country, therefore, lies within the Tropics. Owing to the conformation of the land as regards plateaux and mountain ranges, the climatic conditions of Mexico are determined by altitude rather than by latitude. In passing upwards from the low-lying coast to the heights of the sierra, a rapid change in temperature and vegetation takes place; this produces a series of belts, the varying characteristics of which depend on the vertical relief. These belts are often referred to by their Spanish names, Tierra Caliente, Tierra Templada and Tierra Fria.

Tierra Caliente (hot land) includes the low-lying lands on the coasts of the Pacific and Gulf of Mexico as well as the hill slopes up to a height of three thousand feet. The coastal districts are sandy, tide-water plains broken by inland channels and lagoons; these districts are in many places marshy and very unhealthy. Yellow fever is very common because of the mosquitoes which breed in the swamps. Between 1,000-3,000 ft. the belt consists very largely of debris brought down from the neighbouring mountain slopes; the soil is noted for its fertility, and it is covered with luxuriant vegetation. The tierra caliente is covered with tropical jungle, dense forests of palm, rubber, mahogany and other trees, while cacao and vanilla thrive in it. At certain seasons of the year, violent north winds (called *nortes*) sweep the shores of the Gulf of Mexico.

Tierra Templada (temperate land) is really sub-tropical like the Mediterranean region; it stretches to a height of about six thousand feet. The climate is almost that of

perpetual spring, but the rainfall is greater than that of the tierra caliente. Sugar-cane, coffee, bananas, maize, all grow in abundance; the chief trees are bamboo, myrtle, magnolia.

Tierra Fria (cold land) lies between 6,000 and 9,000 feet in height; it therefore includes the higher portions of the plateau. The tierra fria is really a temperate region in which frosts are rarely experienced; the climate is very healthy, and it therefore embraces those districts which are the most densely populated and most highly cultivated. Oaks and pines grow abundantly, and wheat, beans and potatoes are raised in large quantities.

Above the tierra fria (more than 9,000 feet in height) is a belt in which the climatic conditions are severe, snow and ice covering some of the summits of the mountains; this region modifies the lower belts by intercepting the rain clouds and by lowering the temperature of the air. The belt is almost uninhabited.

Rainfall.—As Mexico lies between the Equator and latitude 30° N., the prevailing winds are the North-east Trade Winds. When the sun is north of the Equator, winds blow from the Atlantic and Pacific Oceans towards the land, because of the low-pressure areas which develop over the plateau; hence the rainy season is from May to October. The windward slope of the Eastern Sierra receives the greater part of the rainfall; Monterey, on the edge of the Eastern Sierra, sixteen hundred feet above sea-level, has a rainfall of 138 inches a year; Vera Cruz on the coast has 90 inches. As the winds pass over the sierra, the northern part of the plateau receives little or no rain. In the valley of Mexico in the south, the annual rainfall is about 25 inches (that is, the same as London). On both sides of the Gulf of California the lands are almost rainless, as they are out of reach of the rain-bearing winds; Culiacan receives only five inches a year. It is probable that the climate of Mexico is gradually becoming drier; this change has been intensified by the reckless destruction of the forests which covered large areas at the time of the Spanish Conquest and conserved

the rainfall; whereas now there is an excess of evaporation of moisture from the exposed surface.

Economic products.—The cereals, maize, wheat, and rice, are extensively cultivated; the most important articles of food being **maize, beans,** and **yucca** (the Mexican banana). Many kinds of **agave** or maguey (the American aloe) grow in Mexico; from one variety is prepared the national beverage called pulque, from another a drink known as mescal; henequen, a third variety, is noted for its fibre. **Henequen** grows best on the dry soils of Yucatan, and the fibre is exported from Sisal, a small seaport; hence as an article of commerce it is known as Sisal hemp.

Cacao, from the fruit of which chocolate is prepared, is a plant indigenous to Mexico; tobacco was introduced into the country from Cuba, and the Spaniards also brought the sugar-cane and coffee.

Countless varieties of **cactus** and other drought-resisting plants grow in the dry regions; the **cochineal,** a small insect which lives on certain kinds of cactus, is no longer needed for its scarlet dye, as it is replaced by aniline dyes.

In Lower California, alfa (esparto) is a coarse grass used for paper-making.

Pasturage.—Domestic animals were brought to Mexico by the Spaniards, but the breeds have deteriorated. Stock breeding is an important industry, especially on the dry steppes of the northern provinces, and in the marshy grasslands (savannas) of Vera Cruz and Tabasco. Cattle are sent in large numbers to Texas to be fattened for the American markets.

Minerals.—Mining is a very important industry of Mexico. Nearly all the mines yield **silver** either alone or mixed with other ores. The average value of the silver obtained every year from the mines is about 8½ million pounds sterling; the value of gold nearly 4½ million pounds, and of copper 3½ million pounds. The output of petroleum is steadily increasing.

Transport.—Goods are carried on pack horses and mules

along tracks across the mountains. Since railways have been constructed the roads have been neglected, and many of them have fallen into decay. The two longest railways are (*a*) the Mexican Central, (*b*) the Mexican National; they both start from Mexico City and cross the plateau to the United States frontier. Many other railways now connect the various seaports with places on the plateau, such as the railway from Vera Cruz to Mexico City. Across the Isthmus of Tehuantepec, a railway nearly two hundred miles long runs from Salina Cruz on the Pacific to Coatzacoalcas on the Gulf of Campeachy. Before the opening of the Panama Canal this railway formed part of an important route from New York to San Francisco.

People.—When the Spaniards landed in Mexico at the beginning of the sixteenth century, they found the country under the sway of Montezuma, the monarch of the Aztecs. The **Aztecs** had subdued the various races which lived on the plateau, but after the Conquest the Spaniards became the ruling class. Nearly half the population of Mexico at the present time are **Ladinos** or **Mestizos,** a mixed race of European and Indian descent; most of them earn their living as farmers, ranchers, muleteers or servants. The native Indians are employed as agricultural labourers.

The inhabitants of Mexico are noted for their indolence and lack of enterprise, due in some measure to the conditions under which they live. Political unrest caused by bad government, together with heavy taxation, has led to revolutionary disturbances; consequently Mexico is in a very backward state, and the natural resources of the country have not yet been fully developed.

Towns.—The people of Mexico live chiefly in the rural and mining districts, the towns being comparatively small in size. **Mexico,** the capital, is the finest city in Spanish America; it is beautifully situated in the valley, and it is surrounded by cypress and pine groves, maize fields and flower gardens. At a distance of two or three miles are the lakes, and in the background the lofty mountains of Popoca-

tapetl and Ixtaccihuatl. **Guadalajara**, on the Rio Grande de Santiago, is the second largest town of Mexico. It manufactures cotton, woollen, pottery and metal wares. **Monterey**, on the eastern margin of the plateau, not far from the United States frontier, is a mining centre and noted for its cattle trade with Texas. **Orizaba** (Fig. 68), four thousand feet above sea-level, is situated in a hot fertile valley, in which sugar-cane is extensively grown; there are large crushing mills in the district. **Puebla**, founded in 1531, is a city with spacious squares and fine buildings; in the valley of Puebla are grown large quantities of maguey (see p. 180) and maize. **San Luis Potosi** stands on the plateau, and was important in the first place because of the mines in the Sierra Madre Oriental; it is now a railway centre. **Chihuahua** was once the centre of a great silver-mining area. **El Paso** (the Ford), on the right bank of the Rio Grande, is 3,700 ft. above the sea; it was originally a mission station, now it is a great railway centre where four main lines meet, viz. from Mexico City, New Orleans, Denver and San Francisco respectively. **Tampico** is a calling-place for steamers from Vera Cruz to New Orleans, and is near an important petroleum district. **Vera Cruz** (true cross) is the chief port on the Atlantic side of Mexico; it has an open anchorage for ships inside a series of reefs; the anchorage is now protected by a breakwater, but during the nortes (p. 178) it is still dangerous for shipping. **Mazatlan** is a calling-place for coasting steamers from San Francisco to Panama. **Manzanillo** is the port of Colima. **Acapulco** has a well-sheltered harbour and also railway communication with the interior; it is a calling-place for ocean-going steamers between San Francisco and South America. At the height of Spain's dominion, the silver fleet sailed from Acapulco every three years to Manilla, and then round South Africa to Cadiz.

The Outlying Provinces of Mexico.—(1) **Yucatan**, a broad peninsula lying between the Gulf of Campeachy and the Caribbean Sea, is often called East Mexico because it is east of Mexico City. Communication between Yucatan and Mexico proper is very difficult except by sea. Yucatan

is a huge limestone mass projecting northwards from the Central American mainland.

Photo. Underwood & Underwood, N.Y.

FIG. 68.—THE CITY OF ORIZABA, AMIDST FERTILE PLAINS AND HIGH MOUNTAINS.
Note the white houses.

Although the rainfall is abundant in the wet season, there are no surface streams in Yucatan; as the water dissolves the limestone, forming great caverns and flowing in subterranean

channels; hence the surface of the country is dry and almost treeless, and the scenery is very monotonous.

Merida, the capital, is the only large town of Yucatan; it is situated a few miles south of its port, Progresso.

The **Great Bank** of Yucatan extends one hundred and twenty miles northwards into the Gulf of Mexico; the water on the bank is less than twenty fathoms deep. Many rocks and reefs, covered with guano, rise above the surface of the sea and are dangerous to navigation. In the direction of Cuba are extensive beds of coral continually growing towards the surface. The Yucatan channel is 1,000-1,500 fathoms deep.

(2) **Lower California**, about the same area as England and Wales, is a long narrow peninsula, traversed the whole length by a ridge of mountains which may be considered to be a southward continuation of the Sierra Nevada in the United States. Except in the extreme south, the whole peninsula is desert land on which cactus and other drought-resisting plants grow. Gold, silver, copper and lead are known to exist in the interior, but the deposits are hardly worked.

La Paz, a small town on a deep bay, has a little coasting trade; near it is a pearl fishery.

The Gulf of California, more than seven hundred miles long, is a sunken valley. The Loretto Archipelago, consisting of granite and porphyry rocks, are covered with guano.

EXERCISES.

1. Describe the climatic conditions at each of the following places: Vera Cruz, Monterey, Mexico City, Culiacan.

2. What climatic belts would be passed in a journey from Vera Cruz to Mexico City? Point out the chief features of each belt.

3. Which parts of Mexico have most rain? Which parts have least rain? Account briefly for the distribution of rain in Mexico.

4. Describe the rivers of Mexico. How is it that some Mexican rivers never reach the sea?

5. The area of Mexico is 786,000 square miles; the total population is 15,500,000.

Six Largest Towns.	Population 1000.
Mexico (Capital),	471
Guadalajara,	120
Puebla,	96
Monterey,	74
San Luis Potosi,	68
Merida,	62

(*a*) Find the population per square mile.

(*b*) State the position of each of the six largest towns, and write one important fact about each.

6. In connection with the geography of Mexico, write notes on the following: sierras, barrancas, nortes, lagoons.

7. Describe the coastal plain which borders the Gulf of Mexico.

8. Say what you know of: cochineal, agave, sisal hemp, yucca.

9. Write an account of the following industries in Mexico: mining, agriculture, cattle rearing.

10. Why are the largest towns on the plateau and not on the coast of Mexico?

11. Say what you know of the people of Mexico as regards their food, drink, occupations and modes of transport.

12. What changes have taken place in the valley of Mexico since the Spanish conquest?

13. Compare the peninsulas of Yucatan and California.

14. Write notes on:
(*a*) The volcanic region of Mexico.
(*b*) The Gulf of California.
(*c*) The isthmus of Tehuantepec.

LESSON XXVI.

CENTRAL AMERICA.

1. On a map of Central America mark roughly the positions of marine channels which once connected the Atlantic and Pacific Oceans.

2. Draw a sketch map of Central America, and mark on it
   (*a*) The line of volcanic mountains.
   (*b*) The capital of each republic.

3. From the subjoined table find which part of Central America has (*a*) the greatest density of population, (*b*) the least density.

Rewrite the capitals in order of population, and opposite each capital state its position.

CENTRAL AMERICA—STATES AND CAPITALS.

States.	Area in	Population.	Capital.	Population.
	Sq. miles.	1000.		1000.
Guatemala, - -	48,300	2,004	Guatemala, -	90
Salvador, - -	7,220	1,226	San Salvador,	67
Honduras, - -	44,300	562	Tegucigalpa, -	29
Nicaragua, - -	49,200	704	Managua, - -	35
Costa Rica, - -	23,000	420	San José, -	50
Panama, - -	32,400	337	Panama, -	60
British Honduras,	8,600	42	Belize, - -	10·5

Physical Characters.—**Central America** connects Mexico in North America with Colombia in South America. Originally this region formed a great archipelago, the islands of which were separated by water channels joining the Atlantic and Pacific Oceans. One of these channels occupied the **Tehuantepec depression**; the formations of which the isthmus is composed have evidently been raised from the bed of the sea to their present terrace-like positions, and in course of time they have been covered with various deposits. On the

Pacific side the land is still rising gradually, in consequence of which many shallow lagoons fringing the coast are slowly drying up.

Other marine channels are now represented by
   (*a*) the transverse valley of the Rio Chixoy in Guatemala.
   (*b*) the valleys of the Rio Humuya and Rio Goascoran in Honduras.
   (*c*) the great depression in Nicaragua in which the lakes are situated.
   (*d*) the pass near Cartago in Costa Rica.
   (*e*) the gap in the divide in the Isthmus of Panama.

These channels were gradually closed by local movements of upheaval, by alluvial deposits, and by lava streams from volcanoes. Hence the mountain ridges which now appear in Central America do not form a geological link between the Rocky Mountains of North America and the Andes of South America. North America may be said to terminate at the Tehuantepec depression.

Near the Pacific coast of Central America the cones of numerous **volcanoes** rise in a broken line, the highest peak being **Acatenango** (13,600 ft.), an extinct volcano in Guatemala; not far from it is Fuego, a volcano nearly as high and frequently in eruption. There are no volcanoes near the Atlantic coast except in Costa Rica.

The Pacific coast of Central America is deficient in good harbours; the chief opening is **Fonseca Bay**, formed by a subsidence of the igneous formations. The volcanic range rises steeply from the narrow coast plain across which short rapid rivers flow. The general slope is towards the Atlantic; in Honduras and Nicaragua rivers of considerable length flow from the central plateau across a broad coast plain to the sea.

Politically, Central America consists of British Honduras—a Crown colony—and six independent States, each of which has a republican form of government.

British Honduras.—The colony of British Honduras consists of a strip of unhealthy coast-land behind which rises a stretch of upland on which a few English colonists

live. Communication into the interior is difficult because of the lack of good roads. The chief products of British Honduras are **mahogany** and **logwood**. The mahogany tree often grows to a height of fifty feet; early in August gangs of labourers usually begin to cut the selected trees. They square the logs and cart them to the rivers on which they are floated to the coast during the rainy season (May-July). The timber is exported chiefly to Europe for furniture and cabinetmaking; mahogany is particularly suitable for this, because it is very hard and takes a high polish.

British Honduras became a Crown colony soon after the occupation of **Belize** by a British force in 1798. At the beginning of the eighteenth century, a British freebooter called Wallace visited the coast, which was then a Spanish possession, and later, English traders gained a concession from Spain to cut mahogany and logwood. The Spaniards corrupted the name Wallace into Baliza, and the English, forgetting its origin, afterwards changed it into Belize.

Guatemala.—The State of Guatemala consists of (*a*) the plain of Peten, an extension of the limestone formation of Yucatan, and (*b*) a central plateau with volcanoes on the Pacific escarpment.

The vertical zones of climate are similar to those in Mexico; mahogany and palms grow on the lowlands, pines and oaks on the uplands. **Coffee**, sugar, maize and cotton are cultivated; bananas and plantains are exported from Livingstone to New Orleans.

Guatemala is an Indian republic; more than half the inhabitants are descendants of the aborigines, and they live chiefly in rural communities; men of Spanish descent live mostly in the towns.

Guatemala, the largest city in Central America, was founded in 1773; it stands in the volcanic region, and it is surrounded by fertile soil. The site of the older capital had to be abandoned because of eruptions and earthquakes.

Salvador.—Salvador (Saviour) is the smallest and most densely populated of the Central American States; it is

confined to the Pacific seaboard. The coast region is very unhealthy, and so nearly all the inhabitants live on the igneous plateau. **Coffee**, sugar and balsam are the chief exports.

San Salvador, the capital, occupies a dangerous position in the volcanic region, but the district near it is very fertile. **Santa Anna** is an important agricultural centre; iron, silver and copper are mined in the neighbourhood.

Tempest Anderson, Geog. Jour.

FIG. 69.—SANTA MARIA, A VOLCANIC CONE IN GUATEMALA.

Honduras.—Honduras (shallows) is said to have received its name from the shoals near Amatique Bay (Atlantic). Coralline reefs and granite isles fringe the north coast. On the Pacific coast, sixty miles of the shore of Fonseca Bay belong to Honduras. Honduras is a hilly country of moderate elevation traversed in many directions by mountain ranges or ridges. The great plain of Camayagua is intersected by a deep depression which once formed a marine channel from the Atlantic to the Pacific. On the grassy

upland plains large herds of cattle are kept. The low-lying coast plain on the north is covered with mahogany, rosewood, cedar and other forest trees. **Coffee**, bananas, tobacco, coco-nuts, pine-apples are important productions. Minerals are obtained from the mountains near the Pacific.

Most of the people are of mixed descent (Ladinos), but there are also descendants of negroes who fled here from the West Indian Islands in the days of slavery.

Tegucigalpa, the seat of government, is a mining centre for gold and silver. **Omoa** and **Trujillo** are small seaports.

Nicaragua.—The Mosquito Coast. At no great distance from the shore is a line of coral reefs and islands covered with coco-nut palms; these reefs are constantly growing, and the gaps between them are being filled up; new islands are also formed by accumulations on the submerged beds of coral. In course of time, therefore, a new coast-line is built up enclosing lagoons between it and the present beach. While this is going on the silt brought down by the inland streams helps to extend the coast seawards and to fill up the lagoons. **Mangrove swamps** stretch along the coast-line, but further inland, extensive savannas cover the alluvial plains, and these provide pasturage for herds of horned cattle.

Yellow fever is unknown on the Mosquito Coast, and on the whole the climate is said to be healthy. Behind the grass-lands are pine forests, while tropical woodland, including rubber trees, cover the terraces which rise to the central uplands.

The great depression runs from north-west to south-east, and is nearly three hundred miles long; from the central plateau the descent into the great valley forms a precipitous escarpment. Two large lakes are situated in the depression:

(1) **Lake Managua** is thirty feet above the level of Lake Nicaragua; its waters sometimes overflow into the lower lake, passing through sixteen miles of country subject to earthquakes.

(2) **Lake Nicaragua** is an immense fresh-water lake drained by the San Juan, at the mouth of which is Greytown. Many

islands in Lake Nicaragua are volcanoes; the twin-peaked Omatepec, an active volcano, is on the largest island.

The inhabitants of Nicaragua are mostly Ladinos, who live in the volcanic region and near the lakes. As in Salvador, the volcanic soils are very fertile, and the people export **coffee**, cocoa, bananas, coco-nuts. Spanish is generally spoken throughout Nicaragua, but English is spoken along the Mosquito Coast, as English freebooters in the seventeenth century were often assisted by the Indians of the district against the Spaniards.

Managua, the capital, stands at the intersection of several trade routes. **Leon**, a larger town than the capital, is on the plain between Lake Managua and Fonseca Bay. **Corinto**, a Pacific port, exports coffee, and is connected with Leon by railway. **Bluefields**, on the Atlantic, exports bananas.

The **Nicaragua Canal** Route was planned to start from Greytown, to follow the course of the San Juan, to cross Lake Nicaragua, and then to reach the Pacific at Brito. The Government of the United States gave up the idea of constructing this canal in favour of the Panama route. The Panama canal was opened for traffic in 1914, but the United States still retain the right of making a canal through Nicaragua if it is necessary in the future.

Costa Rica.—This is a small country with coast-lines washed by the Pacific Ocean and the Caribbean Sea. Two parallel mountain ranges, with the valley of Cartago between them, run through Costa Rica; there are many volcanoes in these ranges. The climate of Costa Rica is marine, but elevation modifies the temperature. The Pacific coast is drier than the Atlantic; on the eastern slopes the rainfall is more than 120 inches a year. The forest vegetation includes mahogany, brazil wood, cedar and rosewood; on the rich volcanic soil **coffee** and **bananas** are grown.

Most of the people (Ladinos) live in the volcanic areas, which are fertile and healthy. There are many peasant proprietors, and as a rule the people are industrious and peaceful.

San Jose is the capital. Cartago, the old capital, was nearly ruined by an eruption of Irazu in 1723. **Puntarenas** on the Pacific, and **Puerto Limon** on the Atlantic are small ports.

Panama.—The cordilleras do not form a continuous mountain range in Panama, but rather a number of loosely connected ridges and spurs which decrease in height towards the Atlantic seaboard; the cordilleras are crossed here and there by passes of low elevation, probably representing

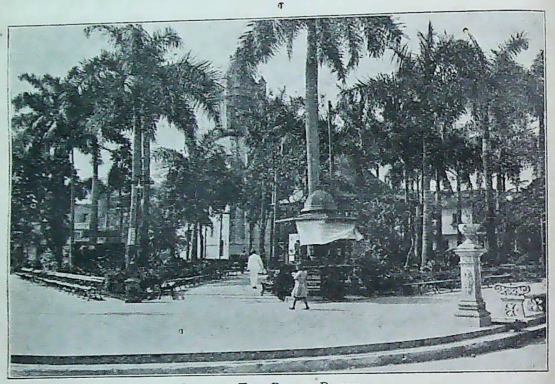


FIG. 70—THE PLAZA, PANAMA.
Note the cathedral amidst the tropical vegetation. (By courtesy of the R.M.S.P. Co.)

marine channels which once connected the Atlantic and Pacific. In Western Panama **Pico Blanco**, an extinct volcano, reaches a height of nearly 12,000 feet. The most important river is the **Chagres**; in the dry season it is very shallow, but in the wet season it becomes an impetuous torrent; its waters are now controlled by a great barrier (the Gatun dam) behind which the water forms the Gatun Lake, an important part of the canal navigation.

The Atlantic side of Panama is hotter and wetter than the Pacific, the rainfall at Colon being about 120 inches. The

whole country is noted for dense tropical vegetation and for birds of gorgeous plumage. The soil is of great fertility, but more than half the area of Panama is unoccupied and only a small part is properly cultivated. The **banana** is the most valuable production; rubber, mahogany, coco-nuts, coffee, cocoa and turtle shell are articles of less importance. Pearls are obtained by divers from the Gulf of Panama.

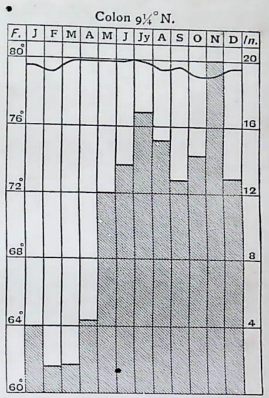


FIG. 71.—COLON.
TEMPERATURE AND RAINFALL.

The towns of **Colon** and **Panama** are under the administration of the Republic, but they are under the authority of the United States as regards sanitation and quarantine.

Panama Canal.—After the conquest of Peru by the Spaniards in the fifteenth century, silver, gold and other products of Peru were brought by sea to Panama, carried on mules across the isthmus to Colon, and thence shipped to Cadiz. With the decay of Spanish power this traffic gradually declined. The importance of the *gold road* across Panama revived, however, with the discovery of gold in California about 1840. The absence of railways across the United States, and the dangers of sending gold by a land route, resulted in the Panama route being used from California to the Eastern States, and in 1855 a railway was constructed from Panama to Colon. With the opening of transcontinental railways, the Panama route once more declined.

The attempt of de Lesseps, the engineer of the Suez Canal, to cut a canal across Panama failed; and it was not until the

Spanish-American War (1898) that the United States Government realised the danger of having to send warships from the Pacific coast round Cape Horn in order to reach the Eastern States. A canal across Panama was therefore decided upon. With this object in view a concession was

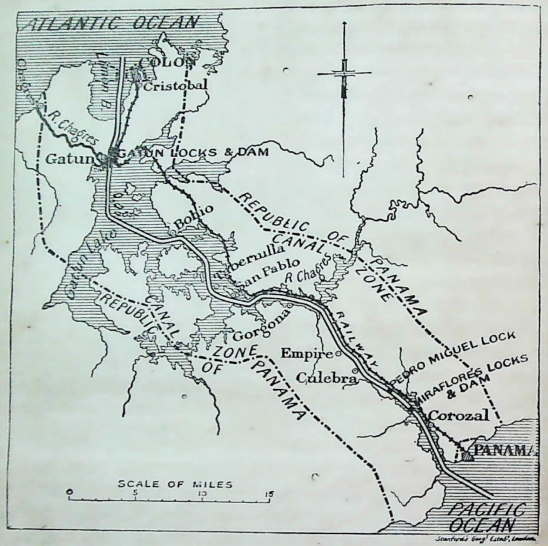


FIG. 72.—THE PANAMA CANAL.

obtained from the Panama Republic, and a canal zone ten miles wide was leased to the United States. The work was begun in 1901, and the canal was informally opened in August, 1914; in times of peace the waterway may be used by ships of all nations on equal terms. During the first year 1,317 ocean-going vessels passed through the canal, and of

these 586 were under the British flag and 544 under the United States flag.

The chief difficulties which had to be faced in constructing the canal were:

(*a*) The unhealthiness of the climate.
(*b*) The flooding of the country by tropical rains.
(*c*) The ridge of mountains which traverses the isthmus.

Malaria and yellow fever have been almost abolished in the canal zone by improving the drainage of the towns, and by

FIG 73.—CULEBRA CUT, PANAMA CANAL, IN COURSE OF EXCAVATION. (By courtesy of the R.M.S.P. Co.)

oiling the stagnant pools to kill the larvae of the infection-bearing mosquitoes.

The **Gatun dam** regulates the flood-water of the Chagres and holds the water up to eighty-five feet above sea-level.

Through the mountains a passage nine miles long has been made; this is known as the **Culebra Cut.** This was the most difficult section of the whole work, for the ridge was more than 300 feet high; landslides also presented an unexpected difficulty, and on several occasions they have caused the canal to be temporarily closed.

The whole length of the waterway is about fifty miles, and the depth of water in the canal is forty-one feet. A ship from the Atlantic enters a dredged channel in Colon Bay and passing the port **Cristobal** proceeds to Gatun. Here the ship is raised eighty-five feet in locks (there is a double set of locks so that another ship may be lowered at the same time), and then crossing Gatun Lake through a marked

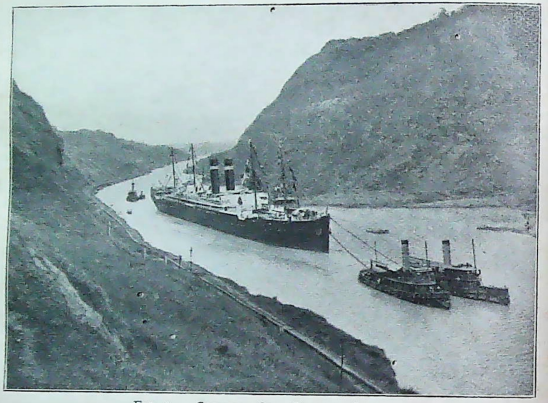


FIG. 74.—CULEBRA CUT, PANAMA CANAL.
(By courtesy of the R.M.S.P. Co.)

channel and passing through the Culebra Cut, it will reach the locks at Pedro Miguel and Miraflores, where it will be lowered to the level of the Pacific; **Port Ancon** is a wharfage at this end of the canal.

The Panama Canal is of great use to the United States for naval purposes and for mercantile trade. It provides also a very direct route from Great Britain to New Zealand and Australia, and it is an alternative route for ships trading between Western Europe and China. The opening of the

canal is of considerable advantage to the countries on the Pacific side of South America.

From New York to Yokohama there are now two possible sea routes without crossing the Equator; the first *via* the Panama Canal is 3,700 miles shorter than the second *via* the Suez Canal.

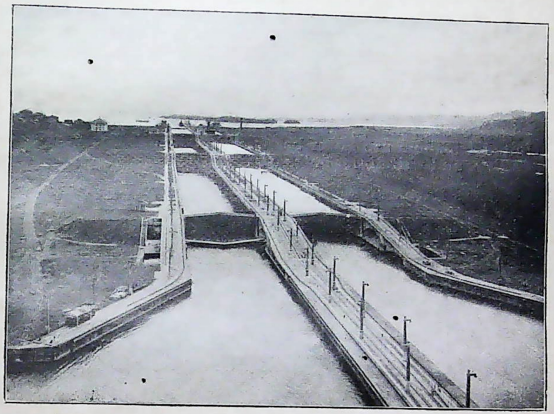


FIG. 75.—GATUN LOCKS, PANAMA CANAL.
In the distance, looking south, Gatun Lake is seen. (By courtesy of the R.M.S.P. Co.)

It is interesting to note that New York to Manila *via* the Panama Canal is practically the same distance as it is *via* the Suez Canal.

EXERCISES.

1. Explain the statement "that Central America was once a great archipelago."

2. Write an account of British Honduras with special reference to mahogany.

3. Describe :
   (*a*) The lake region of Nicaragua.
   (*b*) The formation of new shore lines on the Mosquito Coast.

4. State the position and importance of : San Salvador, Belize, Managua, Greytown, Colon.

5. What articles of commercial value are obtained from Central America ?

6. State the circumstances in which (*a*) British Honduras became a British possession, (*b*) Panama became a republic.

7. Describe the zone through which the Panama Canal has been constructed. Point out the commercial importance of the Panama Canal.

8. The chief articles sent from Central America to the United Kingdom are given below. Rewrite the list in order of value, and write brief notes on the articles.

ARTICLES EXPORTED FROM CENTRAL AMERICA TO U. KINGDOM.

	Chief Article.	Value £1000.		Chief Article.	Value £1000.
Guatemala,	Coffee,	253	Costa Rica, -	Bananas, -	497
Honduras,	Coffee,	2	,, ,, -	Coffee, - -	593
Salvador, -	Coffee,	64	Panama, - -	Shells, - -	8
Nicaragua,	Coffee,	72	Brit. Honduras	Mahogany,	101

9. Examine Fig. 71 ; write notes on the temperature and rainfall of Colon.

LESSON XXVII.

WEST INDIES—GREATER ANTILLES.

1. On a map of the West Indies group the islands under the headings given in this lesson (pp. 199-202). Distinguish (*a*) volcanic islands, (*b*) coral islands.

2. Draw a map of the Greater Antilles. Mark the channels near the islands, and on each island insert the names of two important towns.

3. Note the central position of Jamaica.

From Jamaica draw lines to (*a*) Galveston, (*b*) the mouth of the Orinoco. Measure these lines and compare the distances.

Similarly draw and measure lines from Jamaica to

(*a*) St. Thomas and the head of the Gulf of Honduras respectively.

(*b*) The southern point of Florida and the nearest point on the coast of Venezuela.

4. How far is Kingston (Jamaica) from Colon at the entrance to the Panama Canal ?

The **American Mediterranean** consists of the Gulf of Mexico and the Caribbean Sea, partly separated by the island of Cuba ; it is enclosed by the mainland on the west and by Florida and the West Indies on the east. Ships from Europe and from the Atlantic ports of the United States mostly enter the Caribbean Sea through the three wide channels, the **Windward Passage, Mona Passage** and the **Anegada Channel** ; they enter the Gulf of Mexico through Florida Strait.

The Panama Canal now provides an outlet from the Caribbean Sea to the Pacific Ocean, and in this respect may be compared with the Suez Canal which connects the Mediterranean Sea with the Indian Ocean. On looking at a map of the American Mediterranean, the West Indian Islands appear as a series of stepping-stones between North and South America. The islands may be classified in the following groups :

The West Indian Islands. (1) **The Greater Antilles.**—The four large islands, Cuba, Haiti, Porto Rico and Jamaica, once formed continuous land, traversed by a mountain range the highest point of which was in Haiti (12,000 ft.). This land mass was also connected with Central America (*a*) from Cape de Cruz in Cuba by way of Great Cayman, and (*b*) from Jamaica to Cape Gracias à Dios by way of the Pedro Bank, Rosalind Bank and other shoals and islets.

The Greater Antilles rest on a common submarine bed, and they resemble each other in having the same geological structure; there are no craters and no volcanic materials

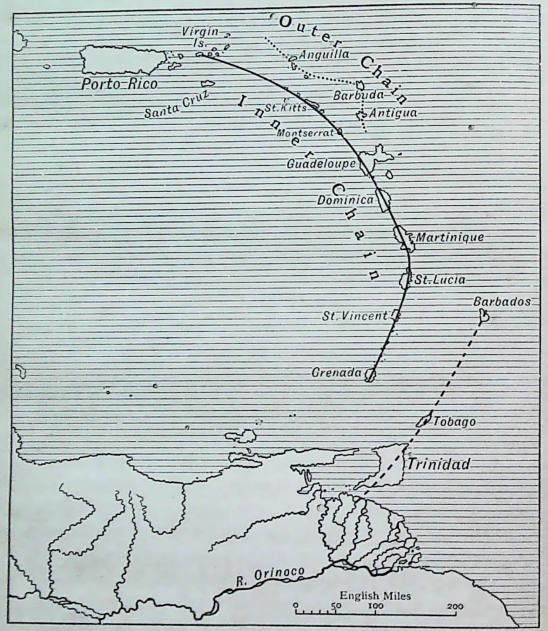


FIG. 76.—THE LESSER ANTILLES.

on the islands. On the north side of Porto Rico the slopes descend to a depth of more than five miles below sea-level.

(2) **The Bahamas** lie to the north of the Greater Antilles;

they are low coralline reefs and islands, and in formation they resemble the limestone peninsula of Florida.

(3) **The Lesser Antilles** (or Caribbee Islands) extend from the Virgin Islands to Grenada in the shape of a crescent which has its convex side towards the Atlantic. In most cases, steep cliffs rise on the eastern side of the islands and fierce Atlantic gales beat upon them; towards the Caribbean Sea the slopes are much more gentle. Most of these islands belong to Great Britain, and they form two administrative divisions, (*a*) the **Leeward Islands** in the north, and (*b*) the **Windward Islands** in the south. In the northern group there is a double chain of islands, so that in a sense the inner islands (Santa Cruz, St. Christopher, Montserrat and others) are leeward in respect of those of the outer chain (St. Martin, Antigua and others); the term leeward used in the first place for the inner chain has become applied to both chains.

If on a map a line be drawn from the Virgin Islands to Grenada (Fig. 76) passing through the inner chain, the line will mark the position of the original mountain range of **volcanic** or igneous formation, now mostly submerged; the highest volcanic peak is in Dominica (5,400 ft.). The islands along this line rise precipitously from the sea, and as a rule they are clothed to their summits with tropical vegetation. Nevis, Saba and others are mere crater cones.

The outer chain (St. Martin, Antigua, Barbuda and others) consists of islands of **marine origin**; coralline reefs have been built up on the submerged seaward slopes of the inner chain. All the islands are of limestone formation except Antigua, which is partly igneous.

(4) Trinidad, Tobago and Barbados form a seaward continuation of the mainland of South America, and do not therefore belong to the same group as the Windward Islands.

Climate.—The climate of the West Indies is tropical but modified by the waters of the surrounding ocean. The Trade Winds prevail all the year round; from October to March, N.E. winds blow strongly, but during the summer

months they become weaker and blow from the east and south-east, gradually returning to the N.E. direction in September. Hence the eastern side of the Caribbees is beaten by continual surf, while the western coasts have usually calm water and deep unsilted harbours. All the important towns of the Lesser Antilles lie on the west side of the islands.

Cyclonic Storms, caused by the sudden expansion of heated and rarefied air, occur most frequently in the months of August, September and October. In a cyclonic storm, the air moves spirally from high pressure to low pressure with great rapidity and at the same time the cyclone moves onward across the region; hence such cyclones are distinguished from ordinary storms by the sudden fall of the barometer and by the wind blowing with the utmost violence successively from different points of the compass. Tropical cyclones are most destructive to life and property, and on many islands strongly built hurricane towers have been erected to protect men from danger.

Inhabitants.—The earliest known inhabitants of the West Indies were (1) **Arawaks**, and (2) **Caribs**. Both came originally from the South American mainland; they were of Mongolic type, yellow to olive-brown skin, long black hair, broad skulls and almond-shaped eyes. The Arawaks were men of low type, indolent, gentle but unprogressive; the Caribs were fierce, warlike and intelligent men who practised cannibalism.

The first Spanish settlement was made in Hispaniola (Haiti), and the Arawaks were soon exterminated. The Spaniards then tried to get Caribs as labourers from the Lesser Antilles; failing in their attempts they took the Arawaks from the Bahamas and left that group uninhabited. Many of the Caribs were killed in their struggle with the Spaniards, but some fled to the mainland of South America.

Negroes from Africa were introduced into the West Indies, and their descendants form a large percentage of the population at the present day.

Cuba.—Cuba, the largest of the West Indian Islands, is separated from the mainland by the Florida and Yucatan Straits and from Haiti by the Windward Passage. The coast of Cuba is rocky, but deep inlets form excellent harbours, the approaches to which are often obstructed by fringing coral reefs.

The eastern part of the island is mountainous; the dry lower slopes of the **Sierra Maestra** are covered with cactus, and

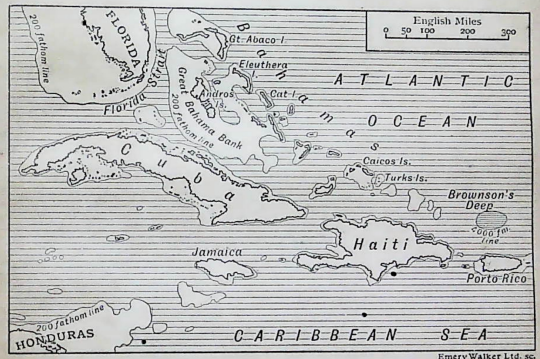


FIG. 77.—THE GREATER ANTILLES.

on the moist upper slopes tree ferns grow. West of Havana is the **Sierra de los Organos**, the crests of which are covered with pine, while the lower slopes and adjoining valleys are used for tobacco plantations. On the more open central plains sugar takes the place of tobacco, and the low disconnected hills are well wooded.

The climate of Cuba is hot throughout the year, the range of temperature being small. From November to February cool winds blow from the north (nortes); during the rest of the year the easterly trade winds prevail; the wet season is from May to October. Rivers bringing enormous volumes

of water cut their way through the limestone formations of the uplands and often enter vast swamps near the coast.

Sir Harry Johnston, Geog. Jour.

FIG. 78.—AVENUE OF ROYAL PALMS, CUBA.

On the whole the climate of Cuba is healthy; good drainage has greatly improved the health conditions of the cities.

Productions.—Cuba is noted for its luxuriant vegetation; tropical plants in great variety and abundance grow in all parts of the island. The **royal palm** is a magnificent tree, and it is very useful to the people of Cuba; some parts of the buds are used for food, the fibrous leaves are made into water-tight vessels, the timber is close-grained and suitable for building purposes, and from the roots a drug is obtained.

Tobacco is grown extensively on the plains, the chief district being the **Vuelto Abajo**. **Banana trees** are often grown on the same areas in order to shade the tobacco plants. **Cigars**, for which Havana is famous, were first made by the natives of Cuba, and they were called by them tabacos, a term afterwards applied to the plant itself. **Cedar** trees growing on the island provide wood for cigar boxes as well as for the lining of cabinet work.

Sugar has been successfully cultivated in Cuba ever since its introduction by the Spaniards; the soil and climatic conditions being particularly suitable. The Cuban planters are energetic and intelligent, and up-to-date methods are employed in preparing the raw sugar from the cane. Hence the planters have suffered little from the competition of beet sugar.

Minerals, especially copper, iron and manganese, are found chiefly in the Santiago district.

Towns.—**Havana**, the capital, stands on a fine harbour with beautiful surroundings; it is noted for cigars and tobacco, and has considerable trade with the United States and Mexico.

Matanzas, **Cardenas** and **Cienfuegos** export sugar from the central districts.

Porto Principe, on a plain midway between the two coasts, is noted for its inhabitants of pure Spanish descent.

Santiago de Cuba, the chief town in Eastern Cuba, is on a harbour almost land-locked; it exports tobacco and mahogany, and is the chief centre of the mining interests.

People.—Cuba was discovered by Columbus and was soon afterwards settled by the Spaniards. The natives, known by the collective name of **Cibunys**, soon disappeared, and they

were replaced by natives from neighbouring islands and from the mainland. A little later, African negroes were brought to Cuba, and their descendants now number about one-third of the population.

Men of Spanish descent are called *creoles*, and in Cuba they are refined and well-educated. Until 1898 Cuba remained a colony of Spain; the disorderly state of the island, the failure of Spanish officials to crush revolutions, and the sinking of the United States warship *Maine*, led to war between the United States and Spain. At the end of the war Cuba was placed under the control of the United States for a time; in 1909 self-government was established for all local affairs, but foreign policy is directed by the United States Government. The position of Cuba at the entrance of the Gulf of Mexico is of strategic importance to the United States.

Porto Rico.—This—the smallest and most densely populated of the Greater Antilles—is now a possession of the United States. The island was discovered by Columbus in 1493, and was used as a penal settlement by Spain until the beginning of the nineteenth century. At the present time the creoles of Porto Rico belong to two social classes: (*a*) the descendants of the military who garrisoned the island during penal times, together with well-to-do traders and planters, and (*b*) the descendants of colonists from Andalusia (Southern Spain) who live on small freehold farms and are hospitable, indolent and thriftless; they are known as **Gibaros**. In 1873 the negroes were set free, and in most cases they remained in the employment of their former masters. In 1898 Porto Rico was ceded by Spain to the United States.

Porto Rico has a regular coast-line with no large inlets or prominent headlands; there are no fringing coral reefs except on the south coast. The interior of the island consists of a moderately elevated plateau from which many perennial streams flow to the sea; forests still cover the highlands. The northern side of the island is exposed to the N.E. winds, in consequence of which the rainfall is abundant throughout

the year; on the stiff clay soils many deciduous trees grow. The southern side of the island receives a very moderate rainfall, and at some seasons there are long periods of drought; in the dry soils acacia trees and thorny plants grow. On the well-drained plains around the coast the land is used for cultivation and pasturage. **Sugar, tobacco, coffee** and **fruits** are the chief crops; palms, tree ferns, cedar, ebony and sandal-wood also thrive. Minerals, including gold, mercury and iron, are found, but only in small quantities.

San Juan, the capital, stands on a land-locked bay with deep water; the remains of the Spanish fortifications are still to be seen. **Plaza** and **Ponce** are small seaports.

Haiti, or Hispaniola.—This island was discovered by Columbus in 1492, and two years later the town of San Domingo was founded by the Spaniards. The name **Hispaniola** or **Española** (little Spain) was given to the island. The natives were soon exterminated, and negro slaves were introduced to work on the plantations. Buccaneers, especially French, began to frequent the coasts, and in 1677 Spain ceded the western section of the island to France. At the time of the French Revolution the slaves were set free, but early in the nineteenth century the negroes rose in revolt, expelled the white settlers and set up a government of their own. Hence Hispaniola became divided into the **Black republic** of Haiti in the west and the **mulatto republic** of San Domingo in the east. In Haiti the blacks speak a corrupt kind of French; they are nominally Catholic in religion, but in the interior they have relapsed into savagery. Revolutions and disorders have prevented progress and development; hence Hispaniola is the most backward of all the West Indies.

Hispaniola is very mountainous; the spurs of the **Sierra Cibao** appear to be extensions of the Sierra Maestra in Cuba and of the Blue Mountains in Jamaica. **Loma Tina** (10,000 ft.) is the highest mountain in the Greater Antilles. From the coasts the land rises steeply to the mountains of the interior, and there is little low-lying land anywhere in the island. Round the coast are bold headlands, lofty peninsulas as

well as deep indentations; in this respect the island presents a great contrast to Porto Rico.

Samana is a magnificent inlet thirty miles long with coralline reefs in it; the shores of the bay are thickly covered with tropical vegetation. On the outer shores of the **Tibaron** peninsula there are also coral reefs; the islands Gonaive, Tortuga, and Saona are detached fragments of the main island.

Agriculture is in a very backward condition in Haiti; cotton, rice, maize, cocoa and tobacco are grown on a small scale. Among the forest trees are mahogany, satinwood and rosewood.

Port au Prince, the capital of Haiti, was founded by French settlers (it is uncertain what prince is referred to).

San Domingo, a picturesque walled town, is probably the oldest Spanish town in America.

Jamaica.—The island of Jamaica is traversed from east to west by the **Blue Mountains**, which reach a height of 7,400 ft. Through the central and western districts extends a limestone tableland in which are many basin-shaped valleys. Numerous streams flow from the highlands to the coast, but as a rule they are unnavigable. Throughout Jamaica the vegetation is luxuriant; mahogany, ebony and palms grow in abundance, as well as spices, dye-woods and medicinal plants. The chief articles of commercial value are **sugar, rum, bananas, pine-apples** and **dye-woods.**

On the whole the island is very healthy; **Newcastle**, situated on the heights to the north of Kingston, is a delightful health resort. **Port Royal** is now a naval station; the old town was destroyed by a hurricane in 1772. **Kingston**, the capital, was terribly injured by an earthquake in 1907; it exports sugar, rum and molasses. **Port Antonio**, on the north side of the island, is the centre of the banana trade. From Port Antonio across the island to Kingston bananas can be seen growing on the foothills.

Jamaica is the most important British possession in the West Indies; it is a Crown Colony, and under its

administration are included the following islands, viz. **Turks, Caicos, Cayman.**

In 1655, having failed to take the town of San Domingo, Admiral Penn and General Venables sailed to Jamaica and captured it from the Spaniards. During the next hundred years, not only did Jamaica become the home of many British colonists, but it also became a resort of buccaneers. Runaway slaves, called **Maroons**, took refuge in the mountains in the centre of the island, and for a long time they were very troublesome to the white planters. Since the emancipation of the slaves, the Maroons have been absorbed largely by the black population on the plantations. The negroes prefer agriculture to any other industry; they live in small villages and hamlets dispersed over the island. The sugar planters in Jamaica were greatly injured by the freeing of the slaves and by the competition of beet sugar. An attempt has been made recently to revive the prosperity of the island by developing a trade in bananas and other fruit.

EXERCISES.

1. Say what you know of the climate of the West Indian Islands. What is a cyclone? How is it caused?

2. Write an account of the island of Cuba under the following headings: position, relief and productions.

3. In what circumstances did Cuba cease to be a Spanish possession? What people live in Cuba at the present time?

4. Write notes on the following: Creoles, Gibaros, Maroons, Caribs, Arawaks.

5. State the position and importance of: Havana, Santiago, San Juan, Kingston.

6. Describe the physical features and productions of Jamaica.

LESSON XXVIII.

BAHAMAS AND LESSER ANTILLES.

1. Draw an enlarged map of Trinidad and the adjacent coast of South America. On the map mark any places mentioned in this lesson.

2. Write in tabular form the names of the British islands in the Lesser Antilles. Opposite the most important islands write the name of the chief town.

The Bahamas.—The Bahamas (or Lucayas) comprise about seven hundred islands and more than two thousand rocks and reefs, but only thirty islands are inhabited. The Bahamas are situated north of the Greater Antilles (Cuba and Haiti), and are separated from the Lesser Antilles by the Brownson Deep. The Tropic of Cancer passing through Great Exuma and Long Island divides the archipelago into parts nearly equal to each other. The absence of uplands and the influence of the warm waters of the Gulf Stream tend to make the islands remarkably uniform as regards temperature and rainfall.

The islands of the archipelago rise from the vast submarine ridge called the **Great Bahama Bank**, and they are the summits of a submerged mountain range. As a result of subsidence, a few of the higher crests alone now rise a hundred feet or more above sea-level, some are only just above the surface of the ocean, while others form banks a few feet below the surface. The Bahamas appear to be of **coralline** formation judging from the fringing reefs and the wind-blown heaps of coral sands. Most of the islands are well wooded; and **sponges** are obtained from the warm waters which surround the islands. **Fruit** culture is on the increase, pine-apples and oranges being exported.

As the Spaniards found no gold on the Bahamas, they abandoned the islands after selling some of the Lucayan aborigines as pearl divers to the traders at Panama, and

after transporting others to the plantations of the Greater Antilles. Later, English colonists from Carolina occasionally visited the islands, and so in course of time the Bahamas came to be regarded as a possession of England; no permanent settlement was made, however, until 1718.

Nassau, on the north side of New Providence, is the only town; it is the capital of the Crown Colony.

Watling Island (San Salvador) was the place where Columbus first landed in 1492.

Leeward Islands.—**Virgin Islands** (so called in reference to St. Ursula), separated from Porto Rico by the Anegada Channel, belong partly to Denmark and partly to Great Britain. **St. Thomas** (U.S.A.) was once a centre of commercial activity, but the abolition of slavery brought ruin to the island, and many of the plantations have been abandoned. At the present time the inhabitants are nearly all negroes.

(1) **Outer Chain.** These islands include the British islands of **Sombrero, Anguilla, Barbuda** and **Antigua**; the French islands of **St. Bartholomew, Descada** and **Marie Galante**; **St. Martin** is partly owned by France and partly by Holland. All these islands (except Antigua) are of coralline formation, and they therefore resemble the Bahamas rather than the neighbouring volcanic groups. **Antigua** is the most fertile island of the chain because of the volcanic soil; sugar is the chief crop. **St. John**, on the west side of Antigua, is the residence of the British governor of the Leeward Islands.

(2) **Inner Chain.** **Guadeloupe** and **Martinique** belong to France, **Saba** and **St. Eustatius** to Holland, all the rest to Britain.

Guadeloupe consists of two islands, Grand Terre and Basse Terre; the latter is entirely volcanic, and is traversed by lofty wooded ridges. **La Soufrière** is a volcano nearly five thousand feet in height. Martinique is noted for its rich vegetation, palms and cedars being abundant. **Fort de France**, the capital, is the chief French naval station of the West Indies. **St. Pierre**, a town of 35,000 inhabitants, was destroyed almost entirely in 1902 by an eruption of

Mont Pelèe. Both Guadeloupe and Martinique were brought to the verge of ruin by the sudden suppression of the slave trade, especially as the planters relied on cane sugar and nothing else; hence they could not compete with bounty-fed French sugar. Bananas, pine-apples, cacao and tobacco are now grown on the islands.

Tempest Anderson, Geog Jour.

FIG. 79.—ST VINCENT.
Note the tropical vegetation and the native hut with thatched roof.

The British islands in this group are less prosperous than formerly. **Montserrat** is now more noted for lime juice than for sugar. **St. Christopher** (St. Kitts) is a highly cultivated island; an extinct volcano rises in the interior to a height of more than four thousand feet. **Dominica**, between the French islands of Guadeloupe and Martinique, originally belonged to France, but was captured by Great Britain in 1756. It is a very volcanic island, and eruptions frequently take place. Exports of cacao, limes and oils are now more important than sugar.

The Windward Islands.—These all belong to Great Britain. **St. Lucia** is a volcanic island with densely wooded slopes. Sugar and cocoa are now successfully cultivated. **Castries**, the capital, a strongly fortified town, is the chief coaling station of the British navy in the West Indies. St. Lucia became British in 1782 when Rodney defeated the French fleet off Castries.

St. Vincent suffered like Martinique from a great volcanic eruption in 1902 in which many lives were lost. **Kingston**, the capital, exports sugar, cacao and spices.

FIG. 80.—BAMBOO GROVE—TRINIDAD.
(By courtesy of the R.M.S.P. Co.)

The **Grenadines** (= pomegranates) consist of more than three hundred reefs and rocky islets; they are without trees. Some stock raising is done on the islands.

Grenada, an igneous cone, is called the spice island of the West Indies. **St. George**, the capital, is the residence of the Governor of the Windward Islands.

The outlying British Antilles.—**Trinidad** (Trinity), the most southerly island of the West Indies, is a detached part

of the Venezuela mainland. On both sides of the **Gulf of Paria** the geological features are the same, and the coast ranges of Venezuela appear to be continued in the peninsulas of Trinidad. The narrow channels leading into the Gulf of Paria are known as the **Bocas of Trinidad**; the more northerly channel is a dangerous passage between bold headlands.

FIG. 81.—BANANAS—TRINIDAD.
(By courtesy of the R.M.S.P. Co.)

The climate of Trinidad is very hot and damp, and consequently enervating to Europeans. From the sea the island appears to consist of numerous hills densely covered with tropical vegetation. Savannas extend round the **Port of Spain**, and beyond them is the dense undergrowth which spreads along the lower hill slopes. Port of Spain, the capital of Trinidad, is a distributing centre for European and American wares throughout the West Indies and Venezuela. Sugar, coffee, cocoa and asphalt are the chief exports.

The **Pitch Lake** is on the west coast of Trinidad about thirty-six miles from the Port of Spain; the lake is about one hundred acres in extent. The origin of the asphalt is similar to that of oil shale from which petroleum is obtained. The asphalt is dug out and is carried on rails laid across the lake; but the rails sink slowly into the asphalt so that they must be raised every three or four days. The excavations made by the diggers gradually fill up; hence, although thousands of tons of asphalt are taken out every year, the supply seems to be inexhaustible.

Barbados, the most easterly island of the West Indies, is about the size of the Isle of Wight. It became a British possession in 1605, and has never been held by any other European power. The inhabitants, numbering two hundred thousand, are mostly negroes, and as a rule they are more highly educated than negroes in the other islands.

Barbados is composed of sedimentary rocks, the uppermost being a limestone of coralline formation; a coral reef nearly encircles the island, and coral is used for road-making and for building purposes. Sugar is extensively grown on account of the fertility of the soil and the cheapness of labour; cotton, mahogany wood, and bananas are other articles of commerce.

Bridgetown, the capital, is the headquarters of the Royal Mail Steamship Co. in the West Indies.

Hurricanes are the great scourge of Barbados; many of the planters have a hurricane wing built to their houses, usually in the form of a two-storied tower very strongly constructed, in which shelter may be sought during a hurricane.

EXERCISES.

1. Say what you know of the Bahamas as regards (*a*) origin, (*b*) position.

2. Divide the Leeward and Windward Isles into volcanic and coral islands. What island will be included in both lists?

3. In what circumstances did the following become British possessions: Barbados, St. Lucia, Bahamas, Jamaica?

4. To whom do the following islands belong: Martinique, St. Vincent, St. Thomas, Saba, Guadeloupe?

5. In what way were many islands in the West Indies affected by the emancipation of the slaves? Give examples.

6. Describe the pitch lake of Trinidad.

7. Write notes on the following: the Gulf of Paria, the Mont Pelèe, Great Bahama Bank, Blue Mountains.

PART IV.

SOUTH AMERICA.

LESSON XXIX.

SOUTH AMERICA—INTRODUCTION.

1. Examine a contour map of South America and note carefully the following facts:

(*a*) The continent extends from north to south through 66 degrees of latitude (11° N. to 55° S.) and at its widest part it extends from east to west through 47 degrees of longitude (35° W. to 82° W.); towards the south, the continent narrows until it terminates in Cape Horn.

(*b*) The greater part of the continent lies (i) within the Tropics, that is, north of Capricorn, (ii) east of longitude 80° W.

(*c*) The coast-line is very regular, except in the south-west; no great indentations penetrate far into the land.

(*d*) A great mountain system (Andes) occurs near the Pacific coast.

(*e*) Two plateaux (the highlands of Brazil and Guiana) are situated near the Atlantic seaboard.

(*f*) All the great rivers—Amazon, Parana, Orinoco and others—flow to the Atlantic Ocean; no important rivers flow to the Pacific.

(*g*) About half the area of South America is less than one thousand feet in elevation; the vast plains are known as Pampas, Selvas, Llanos, etc.

2. Draw a section across South America along latitude 10° S.

3. On a map of South America (showing rivers) (*a*) enclose the basins of the Amazon, Orinoco and Parana with dotted lines.

(*b*) Shade that part of South America which is in the Temperate Zone.

(*c*) Measure the breadth of the continent along latitude 10° S. and the length along longitude 70° W.

South America.—This continent is practically an island, the greater part of which lies within the tropics. The coast-line has few indentations, and the whole of it extends through tropical and temperate zones; in this respect it presents a great contrast to North America with one-third of its coast-line facing the Arctic Ocean. The outstanding features of South America are:

(*a*) The plateaux of Brazil and Guiana, consisting of very old rocks which have been lowered to their present level by subsidence and denudation.

(*b*) The lofty Andean system, near the Pacific coast, due to upheaval, and of more recent formation than (*a*).

(*c*) The extensive lowlands, now represented by the plains of the Orinoco, Amazon, and Parana.

The Lowlands.—These low-lying plains once formed a great inland sea; the marine waters have now given place to the great river basins. Old sea beaches, with lines of shells similar to those found on the shores of the Atlantic, can be seen in many places, *e.g.* Rosario in the Argentine.

During the summer rains, the upper parts of the river basins become once more a great inland sea. From the Marmore to the Pilcomayo, right across the main Amazon-Parana divide, the plains are inundated from October to March, and they appear as a great ocean studded with green islands. As the waters subside, the slightest obstruction diverts the current from one basin to the other, and so there is inter-communication between the great river systems. The Cassiquiare is an example of a permanent connection between the Orinoco and the Rio Negro.

Communication.—When the Spaniards and Portuguese

reached the coast of South America in the sixteenth century, not only did the Andes and the Brazilian highlands respectively prove to be formidable barriers to the interior, but the plains also offered serious obstacles to their advance. On the lofty plateaux of Peru the Spaniards found roads made by the Incas, and these roads showed that the builders must have possessed considerable engineering skill. Some of the ravines even were crossed by rope bridges suspended from either side, and across these not only men but the llama also passed. The steep ascents from the coast up the slopes of the Cordilleras were only traversed by mule tracks. Hence travelling in the Andean region was both difficult and dangerous.

On the great plains travelling was also difficult and in some parts impossible. In the forest region of the Amazon the traveller had to clear a path for himself through the dense tropical vegetation, and such a path was overgrown again in a very short time. The flooding of the plains during the summer rains also impeded the passage of travellers.

On the grasslands of the Argentine, public high roads are even now almost unknown; the fineness of the soil and the lack of road metal account perhaps for the absence of good roads; hence outside the towns a road is merely a track between two wire fences.

Railways.—In consequence of the difficulties stated, railways have played a very important part in the development of South America. The construction of railways has been determined partly by the physical conditions of the continent and partly by the different character of the Spanish and Portuguese settlements. After landing on the coast of Peru in 1532, the Spaniards, eager for gold, advanced boldly into the interior; they climbed the steep slopes of the Cordilleras and overthrew the empire of the Incas. As the tropical conditions on the coast were modified by the altitude of the plateaux, the Spaniards made their chief settlements on the highlands, where the climate was cool and healthy. **Quito, Bogota, Lima, Santiago** are all at a distance

from the coast and at some height above sea-level. In these Spanish States, railways have been constructed to connect the capitals with coast towns.

The Portuguese, on the other hand, were essentially a maritime and trading nation, and they disliked losing sight of the sea; hence their colonies centred on the harbours of Brazil, *e.g.* **Bahia, Rio, Santos** and others; for at least a hundred years they made little advance into the interior of the country. In the nineteenth century, the railways of Brazil were laid down from the ports to the hinterlands in order that coffee, cotton and other products might be exported. Many Brazilian railways climb by steep gradients to the edge of the plateaux.

The tropical lowlands have presented great difficulties to the engineer on account of the periodic floods and the great variation of water-level. Hence rivers had to be bridged or (if they were too wide) train ferries had to be used, embankments had to be made across flood-plains or through swampy areas, and consequently in such a region it was very costly both to construct and to maintain the railway track in a good state of repair.

In these tropical basins the great rivers still form the highways of commerce, and the use of the railway is in many cases to assist and not to supersede river navigation; for example, the **Marmoré-Madeira Railway** (pp. 273-274) provides a convenient means of transport between the upper and lower reaches of the river.

In some districts, especially in the Argentine, railways have preceded the colonist, and the construction of the railways has led to the settlement of large areas. In other cases the older settlements have been joined by the railway to the capital, thus providing the locality with a ready means of transport and at the same time giving the capital a greater hold over a distant province.

International Railways.—Each republic in South America has developed its own railway system without reference to the neighbouring States, and consequently there is no

standard gauge for the various systems. Inter-communication between the States is therefore at the present time particularly difficult. From Buenos Aires it is now possible to travel by railway to Santiago, Asuncion, Monte Video and Rio de Janeiro respectively.

FIG. 82.

Spanish is spoken in the areas with dark shading; Portuguese in those with cross shading.

The uses of the Railways.—(*a*) The railways provide efficient transport for goods.

(*b*) They connect many capital cities with the coast.

(*c*) They strengthen the Federal Governments by bringing the outlying provinces into closer touch with the capital.

(*d*) The international railways not only provide through communication, but they also tend to bring about a better understanding between the various republics.

Latin America.—This term refers to language rather than to race; and it is applied to the whole of South America (except Guiana) as well as to Mexico and Central America. In these regions Spanish, or Portuguese (both of Latin origin), is spoken as the official language. Because of their great numbers the native races of South America were not displaced but were conquered by the European invaders; many of them learnt to speak Spanish or Portuguese, but they did not give up their native dialects; consequently, at the present time, the Quichua, Guarani and other languages are used extensively by the various native races (Fig. 82).

It should be noted that English is the dominant language in North America, both in the United States and in the Dominion of Canada (except in the Province of Quebec, where French is recognised by law). The natives of North America, the Red Indians, were either displaced or they were driven into reservations; hence the native tongue of the Red Indians is now of no importance.

EXERCISES.

1. What difficulties did the Spaniards and Portuguese encounter when travelling into the interior of South America?

2. Why were railways so difficult to construct in many parts of South America?

3. What is meant by an International Railway? Give examples in South America.

4. How have railways helped to develop the resources of South America?

5. Explain the term "Latin America."

6. Name the chief native races of South America, and state the region in which each race is found.

7. In what parts of South America are Spaniards and Portuguese respectively the ruling class at the present time?

LESSON XXX.

CLIMATE AND NATURAL REGIONS.

1. In the table below, the mean temperature and rainfall for each month are given:

TEMPERATURE AND RAINFALL.

	Lima (500 ft.).		Quito (9,300 ft.).		Para (sea-level).	
	F.	In.	F.	In.	F.	In.
January,	71·0	—	54·5	4·3	77·7	10·4
February,	73·4	—	55·0	4·0	77·0	12·6
March,	72·9	—	54·5	5·3	77·5	13·3
April,	70·0	—	54·5	7·3	77·7	13·3
May,	66·0	0·1	54·7	5·1	78·4	9·3
June,	62·1	0·2	55·0	1·5	78·5	5·7
July,	60·6	0·3	54·9	0·9	78·1	4·9
August,	60·6	0·5	54·9	1·5	78·5	4·3
September,	61·3	0·5	55·0	3·0	78·6	3·2
October,	61·9	0·1	54·7	3·7	79·0	2·5
November,	65·8	—	54·4	3·7	79·7	2·3
December,	69·8	—	54·7	3·9	79·0	5·1

(*a*) Find the latitude of each of the three towns.
(*b*) Find the annual range of temperature for each place (that is, the difference between the highest and lowest temperature).
(*c*) Find the average temperature of each town.
(*d*) Find the total rainfall per annum for each.
(*e*) Draw diagrams similar to Fig. 71.

2. In the table below the mean annual rainfall is given:

Town.	Rainfall in inches.	Town.	Rainfall in inches.
Buenos Aires,	34	Santiago,	14·5
Bahia Blanca,	19	Iquique,	0·5
Ushwiya (Fuegia),	120	Coquimbo,	1·6
Cordoba,	26	Valdivia,	115
Mendoza,	6	Ancud (Chiloe),	134
Catamarca,	10	Punta Arenas,	22·5

Write the towns in a vertical column, and opposite each

town write its latitude and any facts which account for the rainfall.

Climate.—The chief factors which determine the climatic conditions of South America are the following:

(1) **Latitude.**—The greater part of South America lies north of Capricorn, and this great region therefore has a tropical climate; in the course of the year the sun swings north and south between the tropics, and the centre of highest temperature follows the sun. In the south-east the summer isotherms (October to March) are convex to the south, the winter isotherms roughly follow the parallels of latitude (see Fig. 84). The January isotherm 80° encloses the centre of high temperature; the January isotherm 64° shows that the land is hotter than the sea, and it also indicates the cooling effect of the ocean current on the Pacific coast (as it nearly reaches the Tropic) and the effect of the warm current on the Atlantic coast (as it reaches as far as 40° S.).

South of Capricorn the climate is sub-tropical and temperate. On account of the narrowness of the continent in the south there is no area in which the extreme conditions of continental climate prevail.

(2) **Winds.**—Between the Equator and latitude 30° S., the South-east Trade Winds blow; north of the Equator North-east Trade Winds blow. South of latitude 30° S., westerly winds prevail throughout the year.

(3) **Relief.**—The elevation of the highlands of Brazil and Guiana moderates the temperature to some extent. The winds from the Atlantic blow across the continent to the foot of the Andes; on the slopes of the Andes the vertical arrangement of climatic belts is met with in consequence of the great elevation (cf. Mexico, pp. 178-9). On the Pacific coast the trade winds blow away from the continent, and the winds from the Pacific are confined to the coast region because of the Andes.

(4) **Ocean Currents.**—Two great marine currents wash the coasts of South America: (*a*) the cold **Peruvian Current** on

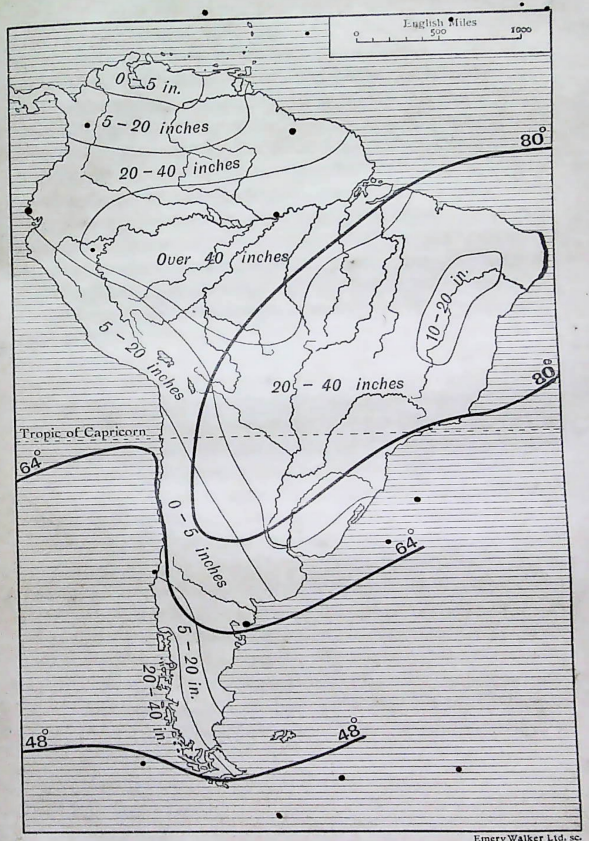


FIG. 83.—SUMMER CLIMATE.
Isotherms for January; Rainfall November-April.

the Pacific side, which has its origin in the Antarctic Ocean; hence winds blowing from the sea to the land on the Pacific side are relatively cool; (*b*) the warm **Brazilian Current**, which has its origin in the great equatorial current of the Atlantic.

(5) **Rainfall.**—During the summer months (November-April, Fig. 83), the high temperature which prevails over the tropical part of South America produces a low-pressure area, and consequently inflowing winds. As the south-east winds reach the continent from the Atlantic, heavy rains fall on the seaward slopes of the Brazilian highlands; the middle course of the Sao Francisco, however, surrounded by mountain ranges, receives a more moderate rainfall of ten to twenty inches. The winds are deflected upwards by the escarpment of the plateau, and they pass over the interior highlands until they reach the Selvas, the dense forests of the Amazon basin; the forests cause the water vapour brought by the winds to condense, and consequently heavy rains fall on the plains. On reaching the Andes the winds precipitate the rest of their moisture on the lower slopes of the mountains. While the sun is south of the Equator the rainfall in the north of the continent (in Venezuela and Colombia) is small in quantity. From May to October (Fig. 84) the sun's control is greater north of the Equator; hence the heaviest rainfall is in Venezuela, Colombia, Guiana and northern Brazil.

Although the rain belt follows the vertical sun in South America as in other tropical regions, the double rainy season is not so well marked as it is in the continent of Africa.

Pacific Coast.—On the Pacific coast the Trade Winds are off-shore winds. As the **North-east Trade Wind** blows across the isthmus of Panama it often becomes a west or north-west wind owing to the low-pressure area on the Pacific margins of Colombia and Ecuador; consequently at such seasons the rainfall is heavy.

Along the coast of Peru the rainfall is scanty, especially in the winter months (May to October); water vapour brought by sea breezes frequently appears as mists on the mountain

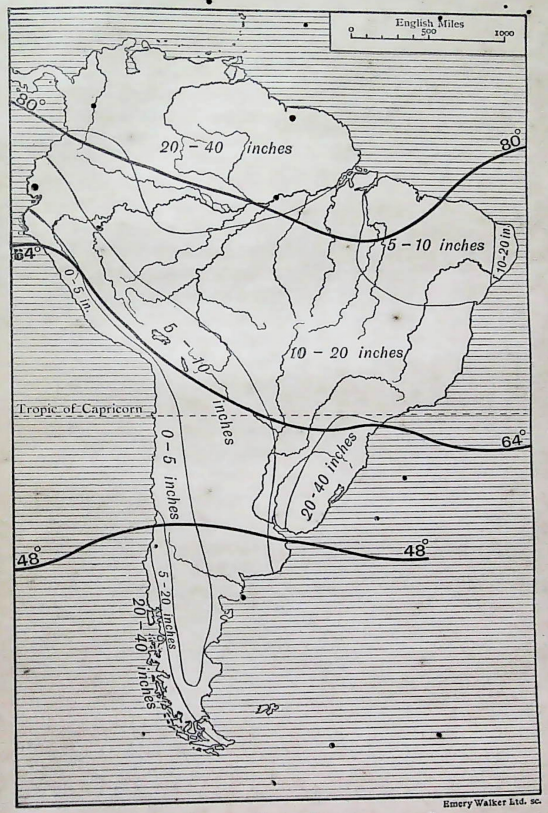


FIG. 84.—WINTER CLIMATE.
Isotherms for July; Rainfall May-October.

slopes, while the coast lands below are parched and require irrigation for raising crops.

Between latitude 20°-30° S. on the narrow strip between the Andes and the Pacific, little or no rain falls throughout the year, as the South-east Trade Winds blow away from the land; this rainless belt is the **Desert of Atacama**, and it lies across the Tropic of Capricorn (cf. the Kalahari and West Australian Deserts also on this Tropic).

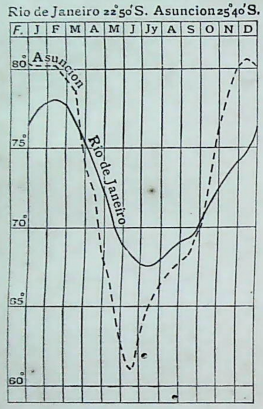


FIG. 85.—TEMPERATURE GRAPHS.

Between latitude 30°-40° S. the rain on the Pacific coast moves north and south with the sun; in the summer months this coast strip is under the influence of the south-east winds, and the rainfall is slight, but in the winter months westerly winds blow and bring heavy rains to Central Chile.

South of latitude 40° S. **westerly winds** blow throughout the year on the Pacific coast; hence Southern Chile has abundant rainfall. In Patagonia, however, the rainfall is scanty at all times because the westerly winds have left most of their moisture on the Pacific side of the Andes.

NATURAL REGIONS OF SOUTH AMERICA.

1. **Equatorial Lowlands.**—These lowlands occupy vast areas in the Amazon basin. Throughout the year the temperature is high, for the altitude of the sun is always great; rain, brought by winds from the Atlantic, falls in every month of the year, but at the equinoxes, when

the sun is vertical on or near the Equator, the amount of rain which falls is greater than at any other period; hence in this region there are two relatively wet seasons. These lowlands are covered with dense forests (called **Selvas**), thick undergrowth and climbing plants; they are intersected with rivers which in the rainy seasons flood the plain over large areas. **Rubber** and **logwood** are the two chief articles of value obtained from the region.

2. **Tropical Grasslands.**—These grasslands, or **Savannas**, occupy large tracts (*a*) in Guiana, Venezuela and Colombia, and (*b*) in Brazil. In Venezuela the grasslands are called **Llanos** and in Brazil **Campos**. These regions are affected by seasonal or monsoon winds due to the sun's control. When the sun is north of the Equator, the heaviest rains occur in the northern region (May-October); when the sun is south of the Equator, the heaviest rains in the Brazil region (November-April). In each case the other months are comparatively dry, and as the lands are always subject to tropical heat during the day, the conditions favour grass rather than forests; trees grow in some places where there is sufficient water in the dry season, and so the tropical grasslands have a park-like appearance. They are particularly suitable for pasturing cattle; the coastal margins are, however, thickly forested.

3. **Sub-tropical Eastern Margin.** Although the conditions in this region are moderated by the sea, the climate is hot in the summer and quite warm in the winter months. Most rain falls in the summer season (November-April). The rich pasture lands support enormous herds of cattle.

4. **Interior Lowlands.**—These plains occupy much of the Argentine. As large areas are at a distance from the sea there is considerable range between summer and winter temperatures; the rainfall is somewhat scanty, especially in the western areas near the Andes, where irrigation is necessary for crops. The southern part of the region is covered with pasturage, and these temperate grasslands called **Pampas** support large numbers of wild horses, cattle,

FIG. 86.—NATURAL REGIONS OF SOUTH AMERICA.

and sheep. Where the rainfall is sufficient, extensive areas have been ploughed for wheat and other crops.

5. **South-east Margin.** The westerly winds, having crossed the Andes, pass over this region as cool, dry winds; hence the climate is bleak and arid. Coarse shingle covers a large part of the plain.

6. **Lofty Plateaux.**—The plateaux of the Andes in Bolivia and Peru, over ten thousand feet in height, are bounded by high mountain ranges. Though situated within the Tropics, the altitude of the plateaux is so great that the climate resembles that of cool temperate lands. The nights are cold at all seasons, and extremes of temperature are often experienced at different times of the year. Herds of llamas, vicuñas, cattle and sheep are kept on these lofty pasture lands.

7. **Western Margin.** This region may be divided into four parts, viz. tropical, desert, sub-tropical and temperate. The **tropical part** has a decreasing rainfall from north to south until it becomes a semi-desert strip on the coast of Peru, where irrigation is necessary for growing cotton, sugar and other crops. The desert of Atacama stretches for some distance north and south of Capricorn; the south-east trade winds blow away from the land, and the district is practically rainless. Large deposits of nitrates are found in the desert because it is rainless; rain would have dissolved the nitrates and carried them out to sea.

The **Sub-tropical Section** has a climate very similar to the Mediterranean countries of Europe and Africa, very hot summers, mild winters and most rain in winter. In some parts of this area irrigation is necessary; wine, olive and fruits are extensively produced.

The **South-west Margin** has a marine climate like that of Western Europe; it is exposed to the full force of the westerly winds and hence the rainfall is heavy. The temperature is moderated by the nearness of the ocean. The mountain slopes facing the Pacific are densely forested, and on the lower lands cattle are pastured.

EXERCISES.

1. Divide into natural regions that part of South America which lies east of the Andes. State the features of each region.

2. Say what you know of the Trade Winds in relation to the climate of South America.

3. Why has Southern Chile a heavier rainfall than Patagonia ?

4. Account for the difference in rainfall on the coasts of Brazil and Chile in the neighbourhood of the Tropic of Capricorn.

5. Examine Fig. 85 ; compare the temperature throughout the year at Rio de Janeiro with that at Asuncion. Account for the difference in temperature at the two places.

LESSON XXXI.

THE ANDES.

1. From the description in this lesson make a list of volcanic peaks, and opposite each peak state its position.

2. Write a list of the chief rivers which rise in the Andes, and in the case of each of them state the river system or ocean to which it flows.

3. Draw sketch maps of
   (*a*) Magellan Strait.
   (*b*) The Titicaca Basin.
   (*c*) The Colombian Cordilleras.

The Andes.—The great mountain system known as the Andes extends the whole length of the South American continent, from the coast of Colombia to Cape Horn. The word Andes is a corruption of **Antis**, the name of a race of people that lived on the mountains of Bolivia at the time of the Spanish Conquest. The whole mountain range was formed by upheaval, and the rocks are of more recent origin than those of the highlands of Brazil and Guiana.

About latitude 20° S. in Bolivia, the mountain system is at its widest ; in this region the two main ranges (viz. the **Western Cordillera**[1] or coast range, and the **Eastern Cordillera** or Andes) broaden out and enclose one of the most extensive and elevated plateaux in the world. The plateau is shut in on the south by a transverse range (Lipez Mountains) and on the north by the meeting of the main ranges in the Vilcanota knot.

P. H. Fawcett, Geog. Jour.

FIG. 87.—SORATA IN THE BOLIVIAN ANDES (p. 234).

Titicaca.—This fresh-water lake, two thousand square miles in area, is situated on this plateau 12,500 feet above sea-level. There are many islands in the lake on which are the ruins of ancient buildings once sacred to the Incas, the rulers of Peru. The shores of the lake are steadily receding because of evaporation, and the bed of the lake is being raised by the silt brought by streams from the surrounding mountains.

[1] The word cordillera (rope or cord) was applied to the long mountain ranges of South America ; the word sierra (saw) to the saw-like ridges of the mountains. In Brazil these words are spelt cordilheira and serra respectively.

The surface of the lake is often disturbed by storms on account of the fierce winds which sweep across the plateau. In crossing the lake, a traveller may suffer from sea-sickness because of the storms, and he may be afflicted at the same time with mountain sickness on account of the rarity of the atmosphere at this great elevation.

The east side of Titicaca is skirted by the Cordillera Real (royal), and many peaks, such as **Sorata** and **Illimani**, rise far above the snow-line, their heights being more than 21,000 feet. Illimani is said to be unsurpassed for its imposing grandeur and varied aspects; it was climbed by Sir Martin Conway, an English mountaineer, in 1898.

From Lake Titicaca flows the River **Desaguadero** (= drain), and after a course of one hundred and fifty miles it disappears in the salt lake **Aullagas** or Paria, from which there is no outlet to the sea. The plateau is therefore an area of **continental drainage** (cf. the Great Basin of North America).

Near Lake Aullagas is the **Cerro de Potosi** (15,400 ft.), and round it is a mass of precipitous heights, detached crests, and jagged ridges, the outer escarpments of which rise like an impassable rampart above the alluvial plains to the east. This region is known as the Bolivian Switzerland.

Peruvian Andes.—From the neighbourhood of Lake Titicaca the Cordilleras run in a north-westerly direction towards the Gulf of Guayaquil. The western range appears from the sea as an unbroken barrier of great height; it rises, however, little above the plateau of which it is the seaward escarpment. In this range are many volcanoes of which **Misti** is the most conspicuous. Between the Eastern and Western Cordilleras is a central range which is not cut through by a river, and forms an unbroken water-parting.

The **Eastern Cordillera** (Andes) is a magnificent range as regards height and grandeur, and through it the Maranon, Huallaga, and several tributaries of the Ucayali, flow in deep gorges to the plains of the Amazon. The **Maranon**, now considered to be the true source of the Amazon, rises in **Lake Lauricocha**, and flows for three hundred and fifty miles

before forcing a passage through the Cordillera. Near the source of the Maranon the various ranges converge in the

Sir Thomas Holdich, Geog. Jour.

FIG. 88.—ROAD FROM TAMBOPATA TO SANDIA.
Just north of Lake Titicaca, near the boundary of Peru and Bolivia.

knot of the Cerro de Pasco, in the neighbourhood of which are many snow-covered mountains.

Montañas.—The lower slopes of the Eastern Cordillera which descend to the plains of the Amazon are called Montañas up to a height of five thousand feet; they are hot, wet and covered with dense tropical vegetation; tree ferns, palms, bamboo, cinchona and many others grow in abundance. In Bolivia the corresponding slopes are called **Yungas.**

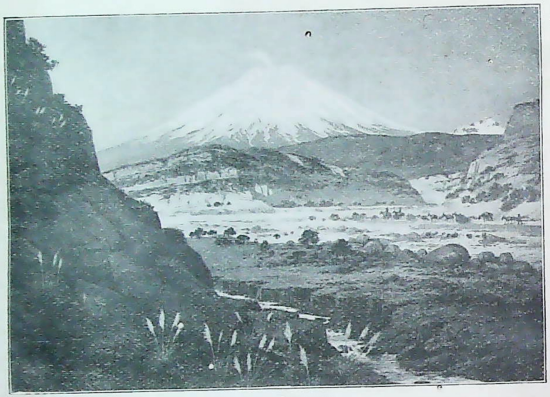


FIG. 89.—COTOPAXI.
(By courtesy of the R.M.S.P. Co.)

Equatorial Andes.—Near the Equator the Central Cordillera disappears; the Eastern Cordillera (the Andes) contains many volcanoes, among which are Cotopaxi, Sangay, Antisana, Cayambe and others. Of these volcanoes the first two are active. **Cotopaxi**, nearly twenty thousand feet in height, has a conical shape (somewhat like Fusi-yama in Japan) and a huge crater with rugged overhanging cliffs; in its frequent eruptions Cotopaxi sends forth vapours, ashes, lava and other materials. From the ridge which forms the western escarpment of the plateau rise many extinct volcanoes of which Chimborazo is the highest; the crater is now filled

with glaciers and the summit of the mountain is covered with snow; hence **Chimborazo** (or silver bell) describes the appearance of the mountain when viewed from a distance.

Chimborazo, Cotopaxi, Antisana and other mountains near the Equator were climbed in 1879 by Edward Whymper (the first climber to reach the summit of the Matterhorn in

FIG. 90.—CHIMBORAZO (FROM RIOBAMBA).

Switzerland). The ranges near the Equator are connected by mountain knots which divide the plateau into nine or ten basins, the average height of which is about eight thousand feet; the drainage from these basins is generally to the Pacific, but several streams flow to the Amazon.

Colombian Andes.—North of the Equator, the main range, or Eastern Cordillera, is continued into Colombia, and it separates the valleys of the Magdalena and Cauca; it

contains many extinct volcanoes, of which **Tolima** is the highest; and it decreases in height as it extends northwards. To the east of the main range is a mountain system quite distinct from it, called the **Cordillera de Bogota**, which contains no volcanoes and is of cretaceous formation. West of the main Cordillera are two ranges, one of which (the Choco) runs close to the Pacific coast.

In the Colombian part of the Andean system there are few plateaux, but longitudinal valleys extend between the various ranges. The River **Cauca** flows in a trench of great depth between rocky escarpments several thousands of feet high; the **Magdalena** also flows in a longitudinal valley for more than a thousand miles until it unites with the Cauca, and flows across a plain to the Caribbean Sea.

Between the Magdalena delta and the Goajira peninsula is an isolated mass of volcanic rocks called the **Sierra Nevada de Santa Marta**, which culminates in fine snowy peaks; the slopes are clothed up to the snow-line with vegetation of extraordinary splendour and variety.

Chilean Andes.—South of latitude 20° S. the double formation (viz. the coast range and the Andes proper with the intervening plateaux and transverse ridges) is maintained in Chile, but the Western Cordillera almost disappears in the north because of erosion and perhaps subsidence, and in the south because of submersion beneath the waves of the Pacific, although it is represented to some extent by the chain of islands which fringes the coast.

Between latitude 30°-40° S., however, the coast range stands out conspicuously, and between it and the Eastern Cordillera is the great **Central Valley of Chile** in which Santiago is situated. The valley is about thirty miles wide, and it is covered with drift, or alluvial deposits, forming very rich soil, and traversed and irrigated by numerous rivers which descend from the Andes and finally reach the Pacific.

Aconcagua.—The Eastern Cordilleras culminate in Aconcagua (23,000 ft.), the highest mountain in South America, and in **Tupungato**, more than 20,000 ft. in height. Both these

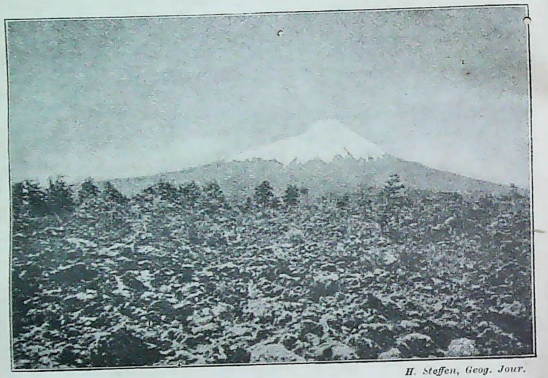
mountains are extinct volcanoes, but there is no trace of craters, as their summits have been worn down by erosion.

W. S. Barclay, Geog. Jour.

FIG. 91.—PASS IN THE ANDES.
Note the limestone mountains with talus (or rock waste) at the foot of the slopes.

Aconcagua is visible on a clear day from ships near the Pacific coast. The whole of its drainage flows to the Atlantic Ocean. Several members of Fitzgerald's party in 1897 first reached the summit of Aconcagua.

In this part of the Eastern Cordillera are several passes such as (*a*) the **Portezuelo Pass** (14,500 ft.) leading to the mining district of Famatina in the Argentine; (*b*) the **Upsallata** or **Cumbra Pass** (11,500 ft.) across which the railway from Santiago runs to Buenos Aires; on account of the elevation of the pass the railway is blocked with snow from



H. Steffen, Geog. Jour.

FIG. 92.—OSORNO VOLCANO IN THE PATAGONIAN CORDILLERAS.
Note the snow-capped cone, and in the foreground the rough lava field.

June to October. In winter all the Chilean passes are dangerous and difficult to cross owing to fierce gales, intense cold, deep snow and lack of shelter.

South of Aconcagua the Cordilleras decrease in elevation, until the average height is little more than eight thousand feet with a few peaks reaching ten thousand feet. **Mounts Sarmiento** and **Darwin** in Faegia belong to the Andean system.

Glaciation.—Throughout the Chilean Andes volcanic activity is dying out, but glacial action persists and in some parts shows signs of expansion; glaciers fill the craters of extinct volcanoes. In southern Chile the formation of

glaciers is assisted by the abundant moisture brought by the westerly winds, and some of the glaciers descend to the level of the sea. In consequence of the sinking of the coast lands of Southern Chile, the glaciated valleys have been filled with sea-water forming fjords, and the coast range has been broken up into a series of islands separated from the mainland by

FIG. 93.—MAGELLAN STRAIT AND TIERRA DEL FUEGO.

numerous channels. The fjords run far into the land, and the slopes rising from them are covered with trees, shrubs, and other vegetation up to 1400 feet; the highest ridges are snow-clad. The **Taytao** Peninsula forms part of the mainland; to the north of it is the large island called **Chiloe**, and the **Chronos Archipelago**, which consists of more than a thousand islands, rocks and reefs; in most of these islands the steeper escarpment faces the ocean.

South of the Taytao Peninsula is an insular chain, the largest islands of which are Wellington, Hanover and Queen Adelaide; they were named in this way at the beginning of the nineteenth century by the surveyors sent by the British Admiralty to chart the islands and channels.

Magellan Strait.—This strait, 340 miles long, connects the Pacific with the Atlantic; it has probably separated Fuegia from the mainland for a very long period, as many of the plants in Fuegia are of different species from those on the mainland.

The Archipelago of **Tierra del Fuego** consists of two groups, one on the Pacific side representing the continuation of the Chilean coast range; and the other on the Atlantic side, a continuation of the Andes and the Patagonian plains. Between the two groups are the Beagle Channel and Darwin Sound, names which recall the voyage of H.M.S. *Beagle* in 1831-36 with Charles Darwin as naturalist.

Eastern Tierra del Fuego is called **King Charles South Land.** Mount Sarmiento with steep slopes and two jagged peaks presents an extremely imposing appearance when seen from Magellan Strait.

EXERCISES.

1. Describe Lake Titicaca. Why is it a fresh-water lake?

2. Briefly explain the terms: continental drainage, mountain knot, montañas, fjords.

3. Say what you know of the following mountains: Chimborazo, Aconcagua, Illimani, Cotopaxi.

4. Which part of the Andes is being subjected to glaciation at the present time? What evidences are there of glaciation?

5. Explain the meaning of the words: Cordillera, Sierra, Andes.

6. Write notes on the following: the Upsallata Pass, Chronos Archipelago, Magellan Strait.

7. Write an account of the Andes under the following headings, (*a*) a watershed, (*b*) a barrier to communication.

LESSON XXXII.

THE WESTERN STATES.

1. The three largest towns in Colombia, Ecuador and Peru respectively are given in the table below. Draw a sketch map and mark these towns, and near each town write one fact of importance.

	Population 1000.		Population 1000.		Population 1000.
Colombia, -	5,071	Ecuador, -	1,500	Peru, -	4,620
Bogota, - -	121	Quito, -	70	Lima, -	143
Medellin, -	71	Guayaquil, -	100	Arequipa, -	40
Barranquilla, -	49	Cuenca, -	50	Callao, -	34

2. The chief articles which Great Britain obtains from Colombia, Ecuador and Peru respectively are given in the table below, together with their values.

Articles.	Colombia.	Ecuador.	Peru.
	£1000.	£1000.	£1000.
Hats and Bonnets, -	45	130	49
Rubber, - - -	25	15	741
Hides, - - -	54	33	5
Cotton, - - -	2	—	884
Wool, - - -	—	—	393
Fruit, - - -	553	—	—
Coffee, - - -	220	5	3
Cocoa, - - -	7	309	—
Sugar, - - -	—	—	475
Silver Ore, - -	46	—	203
Lead Ore, - -	9	—	28
Total Value,	1,028	526	3,150

Rewrite the articles from Colombia in order of value. Take the three articles of greatest value and find what

percentage each is of the total value. Represent these percentages in the form of a diagram. Treat Ecuador in a similar way.

FIG. 94.—COLOMBIA, ECUADOR AND PERU.

Colombia.—Colombia is the only South American State with Atlantic and Pacific seaboards; it consists of two regions, (*a*) the plains of the east, (*b*) the Cordilleras of the west.

The great plains in Eastern Colombia are covered with grasslands, or savannas, in the north, and primeval forests, or selvas, in the south. The rivers which cross the plains flow

either to the Orinoco or to the Amazon; they flood the surrounding country in the rainy seasons, and hence large tracts are covered with alluvial soil. Tropical heat prevails on these plains, the temperature rarely falling below 86° F. The Cordilleras in the west separate narrow river valleys, such as the Magdalena and Cauca; in these valleys the heat is stifling, but, on the slopes of the Cordilleras, elevation moderates the temperature, *e.g.* the range of temperature on the Bogota tableland is 50°-78° F., the annual rainfall is about forty-five inches, and thunderstorms and hail-storms are very frequent.

The low-lying lands on the Pacific coast of Colombia are hot, marshy and unhealthy; clear skies are rarely seen, and rain falls at all seasons of the year. On the Atlantic coast the rainfall is excessive owing to the N.E. winds; more than a hundred inches of rain fall annually on the Santa Marta Mountains.

Productions.—The coco-nut palm, wax palm, tree ferns, rubber and cinchona trees grow in the forests; bamboo thickets in the river valleys; sugar-cane, cacao and bananas are produced in the hot lowlands; and coffee, yucca, maize are cultivated on the cooler mountain slopes. Cattle are pastured on the savannas and in the lower Cauca valley. Gold, silver, platinum, copper and other minerals are mined in the mountains.

People and Towns.—Ninety per cent. of the inhabitants of the republic of Colombia are termed *white*, but there are few people of pure Spanish descent. Uncivilised tribes still live on the eastern plains. Nearly all the settled communities are on the cool elevated plateaux, thus avoiding the tropical heat of the plains and the unhealthy low-lying districts of the lower Magdalena and Atrato.

Colombia is a very backward country, chiefly because it has such poor means of communication. The River **Magdalena** is the most important artery of trade; vessels ascend to the Honda rapids, where there is a break in the navigation of about twenty miles, but above the rapids small boats proceed

for a considerable distance. The **Cauca** and **Atrato** are also navigable for a few miles.

There are no good roads in Colombia, and so articles of commerce have to be carried on pack horses, or mules, along rough tracks; the fewness of bridges across the rivers also hampers traffic, while railway construction has so far made little progress.

Bogota.—The capital of Colombia is Santa Fé de Bogota, situated on a plateau 8,700 feet above sea-level; it was founded by the Spaniards a few miles from the old native capital. Its prosperity is hampered by lack of communication.

Hondo, on the Magdalena, was once an important distributing centre; a railway which connects the navigable parts of the river has taken away some of its trade. **Medellin** is a gold-mining centre. **Barranquilla** stands on a navigable branch of the Magdalena delta; it is a centre of foreign trade, its outport being Puerto Colombia (Savanilla).

Cartagena, on a strongly fortified harbour, was the chief port on the coast under Spanish rule, but it lost its privileges when Colombia became a republic in 1819.

Buenaventura, on Choco Bay, is the only Pacific port.

Ecuador.—Ecuador (= equator), the smallest of the Andean republics, has a coast-line about five hundred miles in length. On the Pacific seaboard the rainfall decreases from north to south; as far as the Equator the coast lands are clothed with dense tropical vegetation, but further south plants become stunted, the region being dry and barren. Of the rivers which reach the Pacific, the **Guayas** is the most important; it is navigable for steamers as far as Bodegas, thus giving access into the interior for a considerable distance. The Gulf of Guayaquil is a broad estuary, the shores of which are clothed with vegetation; plantations of cacao, the most valuable article of commerce of Ecuador, cover an extensive area on the east side of the gulf. South of the estuary the coast district becomes dry and unproductive.

The plateau region, enclosed by Cordilleras in which are many active and extinct volcanoes, is divided into basins

by transverse ranges. The climate on the plateau is cool and healthy on account of the elevation, but as the rainfall is deficient, the vegetation in the basins is somewhat scanty, and drought-resisting plants, such as cactus and agaves, grow

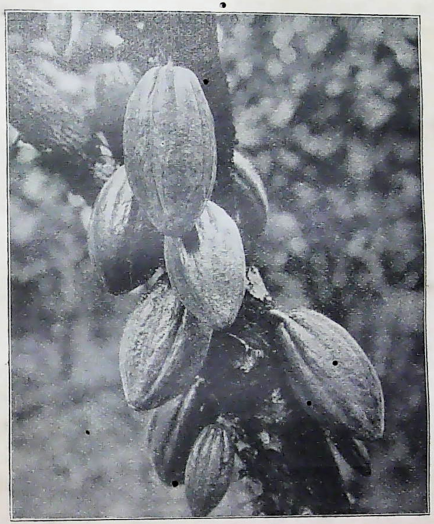


FIG. 95.—CACAO PODS GROWING.
(By courtesy of the R.M.S.P. Co.)

in many districts. A few rivers (*e.g.* Napo, Tigre and others) cut their way through the Eastern Cordillera, and joining the Maranon they flow across the slopes which form a continuation of the woodlands, known in Peru as the Montaña. The climate of this region is excessively humid and hot; the rainfall is so continuous that rain is said to fall "thirteen months in the year." Trees grow to a great height, shooting

up from the saturated soil with tall straight stems; the most important trees are palms, rubber, logwood, cinchona (from the bark of which quinine is obtained), and many others.

Communication.—Goods are carried in boats along the navigable section of the River Guayas, and by a railway from **Duran**, opposite the town of Guayaquil, to **Chimbo**, a

FIG. 96.—MILAGRO, ECUADOR.

Note the tropical vegetation on both sides of the railway. (By courtesy of the R.M.S.P. Co.)

distance of nearly sixty miles. In the interior of Ecuador there are no good roads, but merely tracks. The **llama** is used as a beast of burden as far north as the Riobamba district, beyond which it is replaced by the mule as a pack animal.

People.—The natives of Ecuador are allied in race to the Indians of Peru; they are copper-coloured, broad-shouldered men possessing great powers of endurance; hence

they are useful as carriers. They speak the Quichua language, but most of them understand Spanish. There are few people in Ecuador of pure Spanish descent.

Towns.—Nearly all the towns are situated on the plateau and along the main route leading from Guayaquil to the interior. On the plateau the sites of the towns are healthy, and the surrounding soils are very fertile, as they consist partly of volcanic materials. Many towns have been at various times damaged by earthquakes and by volcanic eruptions.

Quito, the capital of Ecuador, takes its name from the Quitus, the earliest known inhabitants of the country. Although situated close to the Equator, Quito enjoys a delightful climate on account of its elevated position (10,000 feet).

Guayaquil, the largest town of Ecuador, has an unhealthy position on the gulf; it is the centre of foreign trade.

Panama hats are made chiefly in Ecuador, and are exported from Guayaquil. In order to keep the industry in the country, a heavy export duty has been placed on the straw material from which the hats are made.

Galapagos Islands.—These belong to Ecuador; they are only 140 miles from the mainland. The islands are of volcanic origin, and they rise abruptly from the ocean bed. There are a few cone-shaped hills covered with grass on which mists often hang. **Albemarle** is the largest island of the group. Certain species of tortoise, turtle and lizard are indigenous to the islands; hence it is probable that the islands were never connected with the mainland.

Peru [1].—The republic of Peru consists of a coast belt, a plateau region, and the Montañas.

1. **The Coast Belt.**—This belt, about twenty miles wide, receives little rain, as the S.E. Trade Winds lose their moisture in crossing the Andes, and they blow away from the Pacific coast. At certain seasons of the year local winds bring moisture from the sea; hence from June to September

[1] Peru takes its name from a stream (the Biru) mentioned by the Spaniards when they first reached the country; now the existence of the stream is a matter of uncertainty.

there are slight showers of rain, and mists are seen on the Pacific slopes of the Cordilleras; from November to April the coast is dry and the skies are clear. Many intermittent streams cross the coast belt, but for months their courses are waterless ravines; palms and willows grow along the banks of these streams, and when there is sufficient water some of it is used to irrigate the lands on which the sugar-cane, cotton,

W. S. Barclay, Geog. Jour.

FIG. 97.—RAILWAY IN THE RIMAC VALLEY (PERU).
Note the difference in level between the two sections of the railway track.

vines and fruits are cultivated. Between the rivers the land is desert, consisting of drifting sand and low barren hills.

In the north, petroleum is now obtained in large quantities from the desert region which extends for ninety miles between the Rivers Chira and Tumbez. In the southern part of the coast belt, near the Chilean frontier, deposits of nitrate are found.

Many Negroes and Chinese now live on the coast belt, and they are employed to do manual work on the plantations. Men of Spanish descent live mostly in the towns.

Lima, on the River Rimac, the capital of Peru, was founded

by Pizarro in 1535. (Rimac was the name of a Quichua oracle and it has been corrupted into Lima.)

Cuzco, the Inca capital, was too far from the coast for the Spaniards, who depended largely on sea communications. Scarcely a drop of rain falls in Lima for years together. A railway seven miles long connects Lima with its port **Callao**. The bay of Callao is protected by an island, San Lorenzo, and the port is visited by many English and American merchants.

Trujillo, the most important port north of Lima, was also founded by Pizarro.

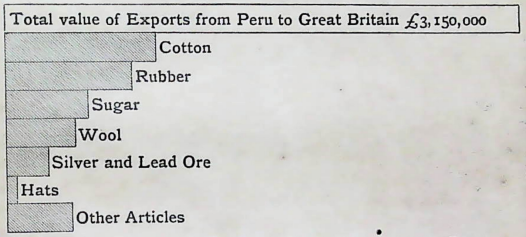


FIG. 98.—DIAGRAM TO REPRESENT THE EXPORTS SHOWN ON THE TABLE, page 243).

2. The Plateau Region.—The Cordilleras run parallel to the coast, and they enclose lofty plateaux from which the Maranon, Huallaga, and other rivers flow through gorges to the Amazon basin. On the plateaux the Incas established an empire, with Cuzco as its capital, early in the eleventh century, and this empire was overthrown by the Spaniards under Pizarro in the sixteenth century. At the present time nearly sixty per cent. of the whole population of Peru are Indians; they live on the plateaux and still speak Quichua, the language of the Incas.

Mining.—This industry is less important than formerly, but it is still carried on in the mountains which rise from the plateau. After the conquest of Peru by the Spaniards, the **silver** mines were worked persistently, and in some cases the

supplies of metal were exhausted. **Cerro Pasco** and **Puno** are now the chief silver-mining centres. Copper and gold are also found in the same districts. Several railways have been constructed from the Pacific coast to the towns on the plateau, and some of them have been extended to the mining

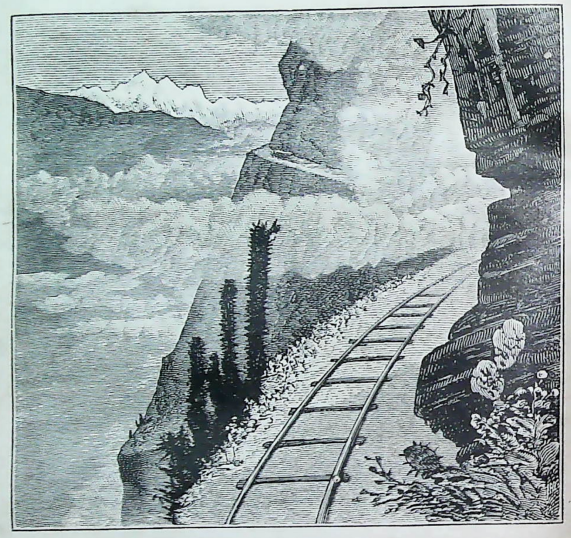


FIG. 99.—OROYA RAILWAY, PERU.

centres. **Oroya**, nearly 16,000 feet above sea-level, is now reached by a railway from Callao and Lima. This railway is one of the most wonderful in the world; it rises from the coast belt and climbs the escarpment of the plateau; it traverses gorges in the Cordilleras and crosses ravines spanned by bridges hundreds of feet high. A branch of this railway reaches Cerro Pasco.

W. S. Barclay, Geog. Jour.

FIG. 100.—CRESCENT DUNES ON THE PAMPA DEL SACRAMENTO, MOLLENDO-AREQUIPA RAILWAY.

Another important railway connects **Mollendo** on the Pacific with **Arequipa**, a distance of one hundred miles, in which the railway rises nearly eight thousand feet. From Arequipa the railway continues to Puno on Lake Titicaca, and from this town a branch line is being made to Cuzco.

On the plateaux of Peru live the **llama, alpaca,** and **vicuña,** animals which belong to the same species as the camel. The llama thrives on the coarse herbage of the Puno region; it was domesticated by the Indians before the Spanish Conquest, and it was used as a beast of burden, as it can carry a load of sixty to seventy pounds' weight. The llama is no longer found in a wild state, and as a pack animal it has been replaced by the horse and mule; it is now kept chiefly for its wool, from which a stout serviceable cloth can be made. The wool of the alpaca is, however, superior to that of the llama, because it is finer and more uniform in texture. The vicuña, still found in a wild state on the Andes, also produces a valuable wool.

3. **The Montañas.**—The Montañas of Peru are the forested slopes of the Cordilleras which descend to the plain of the Amazon. Cinchona and rubber trees grow wild, and from them articles of commercial value are obtained. In the ravines of the Cordilleras, cacao, coffee, tobacco and other crops are cultivated. In the montañas the rainfall is excessive, and in the hot, wet soil all kinds of tropical vegetation abound.

In consequence of treaties between Peru and Brazil, Peruvian vessels have free navigation of the Amazon from this region to the Atlantic.

EXERCISES.

1. Compare the Atlantic coast of Colombia with the Pacific coast. Mention the most important port on each coast.

2. Colombia is a very backward country because of its lack of good communications. Explain this statement, and show in what way it is true.

3. Describe the rivers of Colombia.

4. Compare the climatic conditions on the coast of Colombia with those in the highlands.

5. Compare (*a*) the positions of Quito and Guayaquil, and (*b*) the different conditions under which people live in the two towns.

6. Write notes on :
   (*a*) The Galapagos Islands.
   (*b*) Santa Marta Mountains.
   (*c*) The Gulf of Guayaquil.

7. Say what you know of the mining industry of Peru.

8. Write an account of the wool-bearing animals of Peru.

9. Say what you know of the coast-belt of Peru.

10. Describe a journey from Callao across Peru to the Amazon. What difficulties would a traveller be likely to encounter on such a journey ?

11. How did the following places get their names : Ecuador, Quito, Peru, Lima, Colombia ?

LESSON XXXIII.

THE WESTERN STATES—*Continued.*

1. Measure the length of Chile (*a*) in degrees, (*b*) in miles.

2. The quantities of nitrate of soda exported from Chile for the period 1909-14 are given in the table.

	1000 Metric tons.		1000 Metric tons.
1909, -	2,135	1912, -	2,493
1910, -	2,336	1913, -	2,738
1911, -	2,450	1914, -	1,847

Represent these quantities in the form of a graph. (1 metric ton = 2,000 lbs.)

3. The chief exports and imports of Chile as regards trade with the United Kingdom are given below.

Articles exported from Chile to U.K.	Value £1000.	Articles imported into Chile from U.K.	Value £1000.
Cereals, - - -	675	Coal and Coke, - -	622
Nitrate (Soda), - -	1,146	Cotton Goods, - -	1,316
Copper Ore, - - -	452	Woollen Goods, - -	652
Tin Ore, - - -	306	Iron and Steel Goods,	823
Wool, Raw, - - -	726	Machinery, - -	520
Metals, Manufactured, -	690		
Total Value, -	5,074	Total Value, -	6,022

Draw a circle (radius 3 inches) and divide it into sectors to represent the various articles imported into Chile from the United Kingdom. Mark the remaining sector *other articles* (Fig. 101).

Bolivia.—The republic of Bolivia, formerly known as Alto Peru, takes its name from **Bolivar**, the Liberator who in 1824 freed the country from Spanish rule; Bolivar's lieutenant became the first president of the republic, and the capital Chuquisaca was renamed **Sucre** after him.

People.—More than eighty per cent. of the people of Bolivia are of Indian origin; they are strong, healthy men and well suited to act as carriers on the mountain tracks. In the upper valleys of the Madeira the native tribes cultivate cotton and sugar, and they also rear cattle.

The people of Spanish descent are few in numbers, but they are the ruling class; they live chiefly in the cities and in the mining centres.

Internal disorders are somewhat frequent in Bolivia, partly due to the fact that so many Indians are ruled by a small number of white men.

Bolivia has now no coast-line; in 1883 Chile deprived Bolivia of the littoral district of Antofagasta.

The country consists almost entirely of plateaux, mountain ranges, and deep valleys. The great plateau forms an enclosed basin in which lies **Lake Titicaca**; lofty mountain ranges with high peaks surround the basin. This region is somewhat arid with few perennial streams, but there is sufficient pasturage to support herds of llamas and flocks of sheep; wool and hides are exported.

The mountains in this region are famous for minerals; for three centuries the silver mines of **Potosi** and **Oruro** have been worked, but they are now much less productive than in the early days of the Spanish settlement. Copper is obtained in the **La Paz** district, while gold and tin are widely distributed. The production of tin far exceeds that of any other mineral; large quantities of tin ore are sent every year to Great Britain.

The most favoured part of Bolivia is the **Cochabamba plateau**, more than eight thousand feet high with a mean annual temperature of 50°-60° F.; it enjoys a spring-like climate throughout the year. Many large towns are found in this region.

The real wealth of Bolivia is no longer connected with the mining industry, but it belongs to the ravines and slopes of the Eastern Andes; this region, called the **Yungas**, resembles the Montañas of Peru, and it produces quinine (from the cinchona tree), rubber, coffee, and cocoa. The rivers which cross the Yungas flow either to the Amazon (the tributaries of the Madeira) or to the Paraguay (the Pilcomayo and Bermejo).

Towns.—**Sucre** (Chuquisaca) occupies the site of an old Indian settlement; the Spanish city was founded by Pizarro in 1539 under the name La Plata. It is the political capital of Bolivia, but in population it is surpassed by the three cities La Paz, Cochabamba and Potosi. Sucre is an agricultural centre.

La Paz is the chief commercial city of Bolivia. Goods are carried from La Paz across Lake Titicaca and then by railway from Puno to the coast. La Paz has railway communication also (1) to Oruro the mining centre, and (2) to the seaport Antofagasta.

Potosi, 13,300 feet above sea-level, is the highest town in South America. The silver mines have been nearly exhausted, and so the town is now of little importance.

Cochabamba, on a tributary of the Maranon, is in the midst of a fertile and well-cultivated plain; it is also of some industrial importance.

Tarija, near the border of the Argentine republic, is noted for its fruit gardens and beautiful climate.

Chile.—Chile is a long, narrow country which extends from 18° S. to 54° S., with a breadth varying from seventy to one hundred and forty miles; the coast-line of Chile includes more than half the Pacific coast of South America. South of latitude 41° S. fjords penetrate far into the land, and archipelagoes fringe the coast; north of latitude 41° S. there are no deep bays, as the land rises abruptly from the sea to form hill ranges. The harbour of Valparaiso is surrounded by cliffs of considerable height, and the town is confined to the restricted area between the cliffs and the shore line.

Its extension through so many degrees of latitude gives Chile a great variety of climates; hence it may be divided into three climatic regions, (*a*) the rainless desert of Atacama, (*b*) a sub-tropical area in the central part, (*c*) a region under marine conditions in the south. On the slopes of the Cordilleras a further diversity of climate is also met with on account of the vertical relief.

Atacama.—The arid provinces of the north, known as the desert of Atacama, are noted for deposits of **nitrates**, large quantities of which are exported to Europe for the preparation of various chemicals. The mountains which rise from the desert are dry and treeless, but they yield copper, lead, manganese and other minerals. Were it not for the great mineral wealth, this region would be entirely without inhabitants.

Iquique, a port from which nitrate is shipped, has a rainfall of only half an inch a year; drinking water has to be brought by canal from the Cordilleras.

Antofagasta, situated near the Tropic of Capricorn, exports nitrate from the desert and silver ore brought by railway from Bolivia.

Copiapo is near the southern margin of the Atacama desert; its silver-mining industry has declined, but agriculture is being carefully developed.

Central Chile.—Central Chile enjoys a warm genial climate with winter rains like the Mediterranean countries of Europe and Africa. This region includes the great valley of Chile, which extends from north to south for several hundreds of miles between the coast range and the Eastern Cordilleras (or Andes). The valley is drained by rivers flowing to the Pacific, and there are no unhealthy districts; the soils are very fertile and so agriculture is extensively carried on, cereals, wine and fruit being the chief productions.

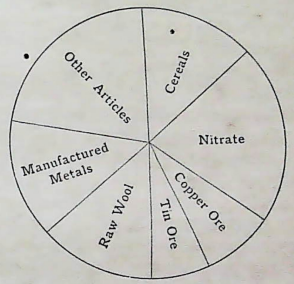


FIG. 101.—EXPORTS FROM CHILE TO THE UNITED KINGDOM.

The sectors in the above diagram are found from the values of the exports from Chile (page 256 Ques. 3). Taking the parts out of 360 for each article, it will be found that Cereals are represented by 48 parts; Nitrate 81; Copper ore 32; Tin ore 22; Raw wool 52; metals 49, and other articles 76.

Santiago (= St. James, the patron saint of Spain), the capital of Chile, occupies a beautiful position on a terrace of the Cordillera. It is at the intersection of several railway routes, *e.g.* westwards to Valparaiso its port; southwards to Valdivia *via* Concepcion; eastwards to Mendoza and Buenos Aires *via* the Upsallata Pass. The latter route is the Trans-Andean railway, and the mountain section of the railway is only open for the summer months (October to June) on account of the snow on the Andes. The journey from Santiago to Buenos Aires takes about three and a half days.

Valparaiso (= vale of paradise) is the chief port on the Pacific coast of South America; it is the outlet of the most productive part of Chile. In 1907 the town was partially destroyed by earthquake.

Concepcion is a small shipping town, and, owing to coalfields close by, it has become a manufacturing centre. A few miles north of Concepcion is **Talcahuano Bay**, the chief naval station of Chile.

Valdivia, near latitude 40° S., has a large number of German settlers.

Southern Chile.—South of latitude 41° S. the coast-line is deeply indented with fjords and precipitous cliffs rising from the sea; the seaward slopes of the mountains are drenched with rain brought by the westerly winds, the rainfall of Chiloe being 134 inches. The mountains are densely forested, and timber-cutting forms an important occupation of the people. In the valleys cattle are reared, and in the fjords and channels fishing is carried on; there is also some seal-hunting on the shores of the islands. On account of the mountainous character of the country this region is very thinly populated, and there are no important towns.

Punta Arenas (= Sandy Point), on the north shore of the Strait of Magellan, is a calling place for steamers; near the town is a small coalfield.

Juan Fernandez, an island of volcanic origin four hundred miles west of Valparaiso, belongs to Chile. Here Alexander Selkirk lived from 1704-9, and his story is said to have suggested *Robinson Crusoe* to Defoe.

History.—When the Spaniards entered the country in the sixteenth century they met with a stout resistance from the native **Araucanians.** These men were mountaineers, and they showed themselves to possess endurance and bravery. In no other part of South America did the Spaniards find such difficulty in subduing the natives, and the struggle lasted for more than a century. During this period Santiago was founded by the Spanish general Pedro de Valdivia.

In 1817 Chile gained her freedom from Spanish rule and became a republic.

During the nineteenth century Chile was the only South American republic that extended her territories at the expense of her neighbours; in 1879 a war between Chile, Peru and Bolivia resulted in Chile gaining Antofagasta and Tarapaca.

EXERCISES.

1. Say what you know of the mineral production of Bolivia.

2. Mention three towns of Bolivia, and state the position and importance of each.

3. In what part of Chile do most people live? Give reasons.

4. Into what climatic regions may Chile be divided? State the chief features of each region.

5. Write notes on:
   (*a*) The great valley of Chile.
   (*b*) The production of nitrates.

6. The four largest towns in Chile are (expressed in thousands of inhabitants): Santiago (398), Valparaiso (187), Concepcion (70), Iquique (45). Where are these towns situated, and why have they become important?

7. In what parts of Chile are the following industries carried on, and under what conditions: agriculture, cattle farming, timber cutting?

8. Write notes on the trade carried on between Chile and the United Kingdom (see Table, p. 256).

LESSON XXXIV.

THE ORINOCO BASIN AND GUIANA.

1. Draw a sketch map of the Orinoco basin; thicken the navigable sections of the rivers.

2. Draw a sketch map of the coast of Venezuela and Guiana; mark on it the chief seaports and river mouths

3. Examine the following table :

Country.	Area 1000 sq. miles.	Population 1000.	Capital.	Population 1000.
Venezuela, - -	396	2,324	Caracas, - -	72
British Guiana, -	89·5	296	Georgetown, -	45
Dutch Guiana, -	46	86	Paramaribo, -	36
French Guiana, -	32	49	Cayenne, - -	14

Find the density of population for the four countries.

4. The chief articles sent to the United Kingdom from Venezuela and British Guiana respectively are given in the table below.

Venezuela.		British Guiana.	
Articles.	Value £1000.	Articles.	Value £1000.
Cocoa, - - - -	29	Sugar, - - -	298
Feathers and Down, -	58	Spirits—Rum, - -	154
Gutta-percha, - -	293	Gutta-percha, - -	114
Copper and Silver Ore, -	134	Timber, - - -	26
Rubber, - - -	20	Cattle Food containing Molasses, - -	31
Total Value, -	581	Total Value, -	642

In the case of the articles from Venezuela and British Guiana respectively make percentage tables and then draw diagrams.

Venezuela.—The Republic of Venezuela consists of three parts, the south-eastern uplands, the central lowlands or llanos, and the northern uplands.

The south-eastern uplands, which form part of the highlands of Guiana, are geologically connected with the Brazilian highlands ; sandstone masses rise in the east of which the flat-topped Roraima is the highest point. The **Sierra Parima** is a plateau, rather than a mountain range, with a steep

escarpment towards the Amazonian plains, but sloping gently on the north towards the Orinoco. The word Parima, meaning *great water*, was the name of a mythical lake in which El Dorado (the city of gold) was said to be situated.

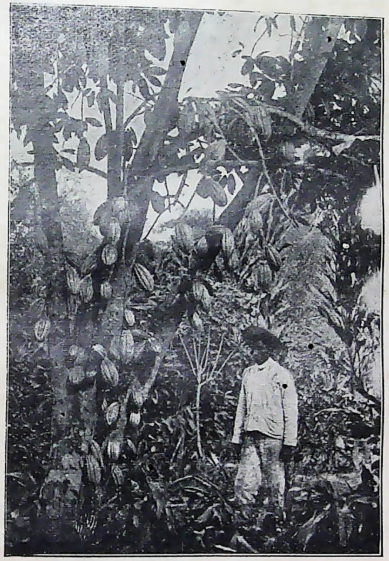


Fig. 102.—Cacao Tree with Seed Pods.

The River Orinoco—This river rises in the Sierra Parima and flows for some distance through a densely wooded district. From the Cassiquiare confluence to the Atlantic the Orinoco flows one thousand three hundred miles with a fall of less than nine inches to the mile. After breaking through the crystalline rocks in a series of rapids, the Orinoco turns to the

east and is joined by the **Apure** and other streams from the Andes. Traversing the northern margin of the plateau the Orinoco cuts a channel through many projecting spurs, and at these points in its course **narrows** (or angosturas) are formed. The most noted of these narrows is at **Ciudad Bolivar**, and this position is also the head of the tidal water 260 miles from the sea. Near **Barrancas** the river begins to form a delta which is covered with forests. The main branch continues in an easterly direction to Barima Point, but the Macaros mouth is also navigable. The Gulf of Paria is being filled up gradually with the silt from the Orinoco. Steamers ply regularly between Ciudad Bolivar and Trinidad; and above Ciudad Bolivar, navigation for small craft is possible to **Caicara** near the Apure confluence. Throughout its course, forest trees fringe the banks of the Orinoco, and during the rainy season the river floods the adjacent lands and deposits alluvium.

Llanos.—To the west and north of the Orinoco are extensive plains called **Llanos**, which rise with gentle slopes from the river to a height of eight hundred feet; they are composed of detritus from the mountains—gravels, sands, clays and other materials. The lower plains (llanos bajos) have a mean elevation of three hundred feet above sea-level; a great part of this low-lying land is yearly inundated and enriched by the overflowing rivers, but the swampy soils are very unhealthy. The upper plains (llanos altos) are more diversified in aspect than the lower; the tributaries of the Orinoco flow across them, and between the rivers the districts called **mesas** (tables) are well drained and in the dry season they become arid. In the Apure district are the **medanos** or ranges of low dunes formed of loose sand drifting before the wind and partially covered with **gamelote**, a tall grass but useless for fodder.

From the uplands the llanos appear as undulating grassy plains which provide pasturage for troops of horses and herds of cattle. Palms and other trees border the streams. The **Llaneros**, or people of the llanos, live chiefly by cattle-breeding;

they cultivate small patches of ground in order to obtain food, but their wealth consists of cattle and horses. The Llaneros are scattered over wide areas, but there are a few villages and towns on the northern border of the plains.

The Sierra de Merida.—This sierra bounds the Llanos on the west, and forms the most northerly spur of the Andes. It reaches a height of nearly 15,500 feet, and many of the peaks are snow-clad; between two of the ridges are bleak treeless plateaux called **parimos**; although within a few degrees of the Equator the climate on the parimos is cold and bleak on account of the elevation (11,000 ft.). On the lowest slopes of the Sierra de Merida, coffee, cacao, and maize are cultivated, and above this belt are forests and then mountain pastures.

A low gap separates the Sierra from the Carib Mountains, or coast range; the latter belongs to the submerged chains of the Antilles (page 201). The **Carib Mountains** skirt the coast-line for some distance as a steep rocky wall, and consequently there are few inlets except that of Guaira; the range is divided into two sections by the depression of Barcelona.

Lake Maracaibo.—Lake Maracaibo is a lagoon rather than a gulf; tides are scarcely felt inside the bar, while its waters are quite fresh, river water being in excess of the marine currents. Spanish navigators who entered the outer basin in 1499 called it the **Gulf of Venice**, and they gave the name Venezuela (little Venice) to the pile dwellings which they saw on the margin of the lake; later, this name became applied to the whole country.

On the east side of the Gulf of Venezuela is the peninsula of **Coro**; herds of cattle are kept on the peninsula, as the rainfall is heavy and the savannas provide abundant pasturage. Mangrove woods extend along the shore-line, and coral reefs fringe the coast.

People and Towns.—Venezuela is mainly inhabited by scattered rural communities and nomad tribes, with scarcely any large industrial or commercial centres. The native

races in Venezuela are descended from **Carib** and **Arawak** stock; at the time of the discovery of America by Columbus these races also lived in the Antilles and Bahamas.

The Spaniards of Venezuela are mostly descended from immigrants from Catalonia and the Basque Provinces of Northern Spain. Simon Bolivar freed Venezuela from Spanish rule in 1821, and for some years Venezuela formed

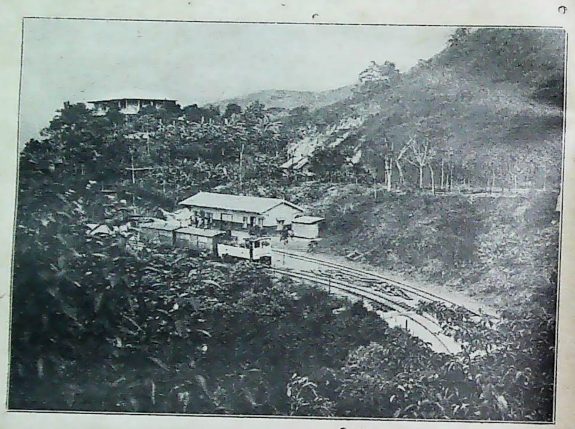


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FIG. 103.—ON THE ZIG-ZAG (LA GUAIRA-CARACAS) RAILWAY.

part of a confederacy which included Colombia and Ecuador, but a separate Government was established in 1828.

Caracas is situated on the southern slope of the Cordillera de Silla, and cacao, from which chocolate is made, is cultivated largely in the neighbourhood.

La Guaira is the seaport of Caracas, from which it is distant only eight miles in a direct line, but twenty-three miles by rail. The climate is hot and wet. It exports coffee and cacao from the fertile Aragua valley.

Valencia occupies a more central position than Caracas, and is near the west end of Lake Valencia, a fresh-water lake in the fertile Aragua valley in which agriculture is extensively carried on.

Ciudad Bolivar (the city Bolivar, so named from the Liberator) is reached by sea-going vessels; it is the only commercial centre in the Orinoco basin. At Bolivar, the Orinoco is less than half a mile wide; hence the old name of the town was **Angostura**. Many drugs, such as sarsaparilla, are obtained in the neighbouring districts.

Maracaibo is on the west side of the channel; it is the natural outlet for the region between the Colombian plateau and the Sierra de Merida. Coffee, cacao and hides are exported.

Guiana.—The word Guiana (spelt in various ways) was originally the name of a number of tribes belonging to the Carib stock. When Spaniards became acquainted with these tribes they applied the name Guiana to the districts along the Orinoco, but when the discovery was made later that all the land between the Orinoco and Amazon was encircled by a waterway formed by the Cassiquiare and Negro, the whole region was called the Island of Guiana. It was this vast area which gave Sir Walter Raleigh the idea of an **Empire of Guaya** (or Guiana), and it was to this region that Raleigh led his ill-fated expedition in search of gold. When the colonial empire of Spain broke up, the land in the interior was divided between the newly formed republic of Venezuela and the Portuguese State of Brazil; consequently, the name Guiana is now restricted to the coast lands held by Britain, Holland and France.

The **aborigines**, mostly belonging to Carib and Arawak tribes, did not mingle with the European settlers, but they withdrew to the interior, where they preserved their tribal customs, their nomadic habits, and their language. The white inhabitants live on the coast lands; Indian coolies have been introduced into British Guiana and negroes into Dutch Guiana.

Physical Features.—The coast plain consists of alluvial soil brought down by the Essequibo, Corentyn and other rivers; and on this fertile soil cane sugar is grown in large

Sir Everard F. im Thurn, Geog. Jour.

FIG. 104.—KAIETUK FALLS, POTARO RIVER, BRITISH GUIANA.
This photograph was taken at a time of drought.

quantities. Towards the interior, the land rises more than a hundred feet in height to a forest belt of impenetrable woodlands. Rivers provide the only means of passage, and, although there are falls and rapids, canoes can travel far inland.

Beyond the forests are **savannas** or tropical grasslands, above which rise the plateaux and mountain ranges forming the watershed between the Guiana rivers and the Amazon basin; the chief ranges are the Sierras **Pacaraima** and **Acorai**. **Mount Roraima**, nearly nine thousand feet in height, stands where British Guiana, Venezuela and Brazil meet; it is a mass of sandstone with steep rocky walls which spring abruptly from a vast accumulation of materials on the plateau. Several streams flow from Mount Roraima and form cascades of great height.

Climate.—The essential features of the climate of Guiana are a high temperature and much moisture. The rainfall is more than a hundred inches a year, and it is distributed somewhat uniformly over the country; the atmosphere is always saturated with moisture. The north-east trade winds blow with great force from November to February and from May to September.

The tropical heat and abundant rainfall on the coast lands make the climate very enervating for white men, and in some places it is unhealthy.

British Guiana.—Sugar, molasses and rum are the chief articles of export; but gold is found in the interior on the borders of Venezuela.

Georgetown, the capital, is named after George III. It is on the River Demerara, and is the largest port between the Orinoco and Amazon.

New Amsterdam, on the River Berbice, retains its Dutch name.

Dutch Guiana.—This is also called Surinam: it exports sugar, cacao, bananas and gold. There are no railways and few roads.

Paramaribo, the capital, is the only town in the colony.

French Guiana.—French Guiana is also called Cayenne. It has never made much progress because it is used as a convict station; the worst criminals are kept on Devil's Island near Cayenne. French emigrants will not go to French Guiana because of its bad reputation, its unhealthy climate, and because they would have to live under military law.

Gold-mining is the most important industry, although rice, sugar and maize are grown

Cayenne is the capital.

EXERCISES.

1. Describe the course of the River Orinoco. In what way is it connected with the Amazon ?

2. Describe the Llanos with reference to relief, scenery and inhabitants.

3. Say what you know of the distribution of mountains in Venezuela.

4. Write an account of (*a*) agriculture and (*b*) cattle farming in Venezuela.

5. State the position and importance of Caracas, Ciudad Bolivar, Valencia, Maracaibo.

6. Write notes on the following :
   (*a*) Sierra Parima.
   (*b*) Lake Maracaibo.
   (*c*) The Llaneros.

7. Give brief explanations of the following : angosturas, medanos, parimos.

8. Account for the origin of the following names : Venezuela, Guiana, Ciudad Bolivar, Georgetown.

9. Of what races of people are the inhabitants of Venezuela and Guiana chiefly composed ?

10. Write an account of Guiana with special reference to physical features, climate and productions.

LESSON XXXV.

THE AMAZON BASIN.

1. Draw a sketch map of the Amazon and its tributaries. Thicken the parts of the rivers that are navigable from Para.

2. Measure along the rivers the following distances :
   (*a*) Para to Manaos.
   (*b*) Para to Tabatinga.
   (*c*) Tabatinga to Lake Lauricocha.

3. Write in tabular form the chief right-bank tributaries and left-bank tributaries of the Amazon. State where each tributary has its source.

4. Draw a sketch map to illustrate the route of the expedition which resulted in the discovery of the course of the Amazon.

Discovery of the Amazon.—In 1540 **Gonzalo Pizarro**, governor of Quito and brother of the conqueror of Peru, set out from the city of Quito to explore the lands which lay to the east of the Cordilleras. He took with him a large company of Spaniards and Indians, and crossing the mountains he descended the slopes through the dense forests and undergrowth which obstructed his progress. After encountering many difficulties, he reached a river (the Napo) and he followed its course for many miles ; at length he ordered a small vessel to be constructed to carry the weaker members of the company. Soon afterwards, Gonzalo made a camp by the river-side, and he entrusted the ship and a crew of fifty men to one of his friends called **Francisco de Orellana**. As the provisions in the camp were nearly exhausted, the commander of the ship was ordered to sail on in order to find the great river of which they were in search, and if possible to obtain a supply of provisions. Orellana sailed down the **Napo** to the junction with the Amazon ; here he found no supply of food as he expected ; the current of the Napo was too strong for his ship to sail against it, while a return by land to Gonzalo's camp seemed hardly practicable. Orellana therefore decided to abandon all thought of returning, and he launched forth on the mighty Amazon to seek adventure, while exploring the course of the river. In spite of dangers from rapids, rocks and warlike tribes, who attacked his men whenever they tried to land, Orellana succeeded in navigating his ship to the mouth of the Amazon. After sailing along the coast to a Spanish colony, he crossed the Atlantic and reported the circumstances of his exploit to the Court of Spain. As he was returning to South America, Orellana died on the voyage.

Although the course of the Amazon was first discovered by a Spaniard, the region through which it flows was claimed by the Portuguese as part of the territories of Brazil.

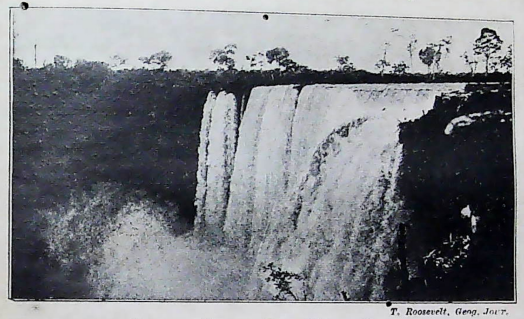
It should be noted that after Orellana's desertion, Gonzalo was compelled to turn back to the west; more than half of his men perished on the return journey, and after suffering untold hardships, the survivors at length reached Quito after an absence of nearly three years.

River Amazon.—The headwaters of the Amazon take their rise in Lake Lauricocha on the plateau of Peru, 14,000 feet above sea-level. The river, first known as the **Maranon**, crosses the tableland, forces its way through the Cordilleras in a succession of gorges, and thus descends to the plains below. It is joined by the Ucayali, which also rises in the highlands of Peru. The united stream enters Brazilian territory at **Tabatinga**; at this point the water is only 270 feet above sea-level, and it has 2,400 miles to flow to the Atlantic; hence its fall is about one foot in ten miles.

From Tabatinga to the Rio Negro confluence, the river is often called the **Solimões**, but the name Amazon is now usually applied to the whole river course from the foot of the Andes to the Atlantic.

Owing to the tropical rains which especially affect the tributaries from the south, the Amazon begins to rise in January, and for several months vast tracts are flooded; the flood water is often as much as sixty feet above low-water, and when the floods subside a layer of sediment is left on the plain. At this season, the effect of the flooding is heightened by the great bore (called **pororoca**), or tidal wave, which moves up the estuary and even seems to drive back the water of the main stream. Before one tidal wave becomes exhausted others are formed at intervals of twelve hours; hence a succession of waves of varying height follow each other up the estuary. The Amazon does not form a true delta; the drainage of half a continent discharges into the Atlantic through a single channel in which are Mexiana, Caviana and other islands.

Marajo.—Marajo (or Joannes) is really part of the mainland, from which it is separated in the west by a few narrow passages. The **Rio Para** is a broad estuary on the south side of Marajo. The channels connecting the Rio Para with the Amazon are so narrow that two steamers cannot pass each other; in flood time, however, these channels become one great sheet of water.



T. Roosevelt, Geog. Journ.

FIG. 105.—UTIARITY FALLS, KERMIT RIVER.
One of the falls by which the water flows from the Matto Grosso to the River Madeira.

Tributaries of the Amazon.—Many of these affluents surpass the largest European rivers in length and volume. The **Parus, Jurua** and other lowland streams within Brazilian territory are sluggish and free from rapids, and are therefore navigable almost to their sources. The **Madeira**, on the other hand, is an impetuous river; it is formed by the junction of the Guapore, Marmoré and Beni, which rise on the plateaux of Bolivia and Peru. The united river cuts its way through projecting spurs of the Cordilleras, and so reaches the low-lying plains. In the descent from the highlands are many gorges, rapids and waterfalls. The **Madeira Falls**, near the frontier of Bolivia and Brazil, obstruct the navigation of the river, and a railway has been constructed to connect the

navigable reaches of the river. This railway (Madeira-Marmoré), far remote from great centres of population, belongs to the Federal Government of Brazil, but it provides Eastern Bolivia with an outlet to the Amazon. The railway, 225 miles long, is on the right bank of the river and connects Guajara Merim above the rapids to Porto Vello, where ocean-going vessels of seven thousand tons can load their cargoes.

The Madeira brings down much driftwood from the lower slopes of the Andes, and the first explorer was thus reminded of the driftwood round the Madeira Islands (off the African coast), and so he named the river Madeira after the islands.

The **Tapajos** and **Xingu** cross the Matto Grosso (p. 279); as they descend from the plateau to the plains they are impeded by rapids and falls. The Tapajos is navigable for two hundred miles from **Salto Augusto**[1] to the Amazon, but the Xingu is obstructed by cataracts after it crosses latitude 5° S.; hence little of its course is navigable.

The **Rio Negro** is the largest left-bank tributary of the Amazon, and it is joined to the Orinoco by the Cassiquiare. After crossing the Equator it receives the Rio Blanco from the mountains of Guiana, and it is navigable from Santa Izabel to Manaos, a distance of four hundred and fifty miles.

The **Tocantins** enters the Rio Para and is not therefore a tributary of the Amazon. After the junction of the Araguay and Tocantins the river is obstructed by the Great Falls within a hundred and thirty miles of the sea. Above the Falls there is little navigation; hence the country drained by these rivers is in a backward state of development, as there are at present no other means of communication.

In the upper part of its course the **Araguay** divides into two streams which unite two hundred and fifty miles lower down, thus forming the great island of **Bananal** (= banana grove); this rich alluvial tract is eight thousand square miles in extent, and it rises above the highest flood.

The Lowlands of the Amazon basin cover an area of eight hundred thousand square miles, with a mean altitude of less

[1] Salto = waterfall, leap, cf. Sault Ste. Marie, p. 52.

than four hundred feet. These lowlands consist of alluvial soil of recent formation due to the overflowing of the rivers:

FIG. 106.—RUBBER TREES IN FLOWER NEAR PARA.
Spruce's *Notes of a Botanist on the Amazon and Andes.*

they are bounded north and south by the escarpments of Archaean (very old) rocks. Here and there sandstone hills rise above the surface of the low-lying plain and form a

conspicuous feature of the landscape. At **Obidos, Santarem** and other places where they occur, the course of the river is narrowed, the cliffs or bluffs rising in some cases to a height of a thousand feet.

Selvas.—The rich alluvial soil annually flooded by the tropical rains, together with the high temperature, provide conditions eminently suitable to the growth of trees; hence dense forests (selvas), in which trees grow to an unusual height, cover the whole region. The rays of the sun can with difficulty penetrate into the gloomy recesses of these forests, and so creepers and climbing plants struggle upwards for light and air. Palms, rubber, logwood, brazilwood and other trees abound, while plants with long, broad and glossy leaves grow on the swampy tracts of the inland areas. Birds of brilliant plumage and animals of many species abound in the forests. A few tribes of uncivilised Indians also live in some parts of the region.

The impenetrable forests are intersected by the Amazon and its tributaries, and it is along these streams alone that travellers can reach the interior of Brazil.

Rubber and **logwood** are the two most important articles of commerce obtained from the forests of the Amazon.

Para, on the right bank of the Tocantins, is seventy miles from the Atlantic; rubber and vanilla are exported.

Manaos, on the Rio Negro, ten miles from the confluence with the Amazon, is a distributing centre for European goods.

EXERCISES.

1. Describe the course of the Amazon from Lake Lauricocha to the mouth. Contrast the parts of the river above and below the 600 ft. contour line.

2. In what circumstances was the course of the Amazon discovered?

3. Write notes on the following: (*a*) Rio Cassiquiare, (*b*) Rio Para, (*c*) pororoca.

4. Write an account of the forests of the Amazon. State the articles of commercial value obtained from these forests.

5. Why are there so few towns in the Amazon basin? Mention three towns on the Amazon, and say why each town is important.

6. Say what you know of: Marajo, Bananal, Madeira Falls, Salto Augusto.

LESSON XXXVI.

THE ATLANTIC STATES—BRAZIL AND URUGUAY.

1. From the subjoined table find:

(*a*) How many times Brazil is larger than Uruguay.

(*b*) The population per sq. mile of Brazil and Uruguay respectively.

	Brazil.	Uruguay.
	Sq. miles.	Sq. miles.
Area,	3,291,000	72,000
Population,	24,308,000	1,316,000

2. Draw the coast-line of South America from the mouth of the Amazon to the mouth of the Parana. On this map mark as many towns as possible from the subjoined table; near each town write the chief articles produced in the neighbourhood.

LARGEST TOWNS OF BRAZIL AND URUGUAY.

Towns.	Population 1000.	Towns.	Population 1000.
Rio de Janeiro,	1,129	Porto Alegre,	100
Sao Paulo,	450	Manaos,	50
Bahia,	290	Santos,	35
Pernambuco,	150	Monte Video,	378
Para,	200		

3. On a map of Brazil find the routes of the following railways :

(*a*) The Madeira-Marmoré Railway, 225 miles long.

(*b*) Short railways into the interior from Bahia, Pernambuco and Portaleza.

(*c*) The railway from Rio to S. Paulo and Santos (this line carries the heaviest traffic of any railway in Brazil).

(*d*) The railway from Rio to Pirapora on the São Francisco, 628 miles ; from Pirapora to Joazel by steamer, 676 miles ; Joazel to Bahia by rail, 361 miles ; Rio to Bahia by sea, 737 miles.

(*e*) The railway from Santos *via* S. Paulo to Corumba on the Paraguay, 1,200 miles. (This railway is important (i) commercially, as cattle, hides, etc., are carried from Matto Grosso (p. 279) ; (ii) politically, as it runs near the frontiers of Bolivia and Paraguay.)

(*f*) The railway from Rio *via* S. Paulo to Monte Video, 2,000 miles (or by branch line through Entre Rios and by train ferry to Buenos Aires) ; Rio to Monte Video by sea, 1,015 miles.

On an outline map of Brazil mark the routes given above.

Under the map state the following : (i) the distance from Rio to Bahia by the São Francisco route ; the number of miles saved by the sea route. (ii) By how many miles more would a man travel by rail from Santos to Corumba than by river from Para to Manaos ?

Brazil.—The Highlands of Brazil may be compared to a great island surrounded by low-lying plains on the north and west, and by the ocean on the east The highlands are composed of very old rocks which have been worn down by denudation into great plateaux, scored into deep valleys between which are steep ridges or serras.[1] The most prominent of the serras are : (1) The **Serra do Mar** (Sea Mountains) and the **Serra de Mantiqueira**, which form the south-eastern edge of the plateau and separate the head-waters of the Parana from the Atlantic ; in the latter range

[1] Serra and cordilheira are the Portuguese forms of the Spanish words sierra and cordillera respectively.

is **Mount Itatiaya** (9,000 ft.), an extinct volcano and the highest peak in Brazil.

(2) The **Serra do Espinhaço** (spinal range or backbone), which separates the São Francisco from the rivers flowing directly to the Atlantic.

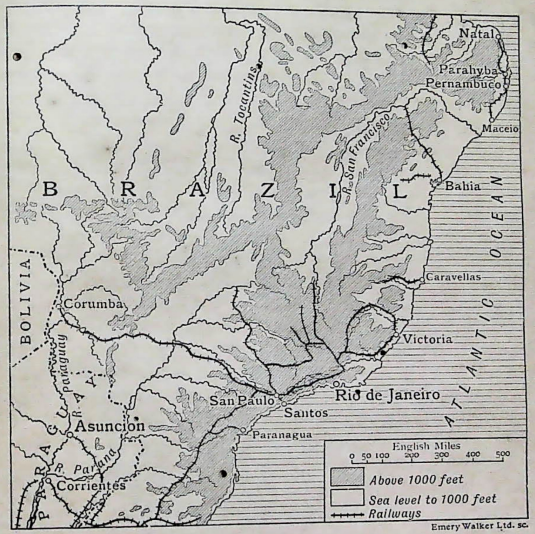


FIG. 107.—CONTOUR MAP OF S.E. BRAZIL SHOWING THE CHIEF RAILWAYS.

(3) The **Espigão das Vertentes** (crest of the watersheds), which extends from north to south between the Tocantins and São Francisco and between the Paraguay and Parana.

Campos.—West of the serras the highlands are locally called Campos, and they merge into the plateau of **Matto Grosso.** The campos are not mountain ranges but rocky escarpments

of the great tableland which slope gradually to the plains of the Amazon, but which fall abruptly to the Paraguay basin. Hence, when viewed from the south they look like long mountain ranges of moderate altitude, and are called **serras** or **cordilheiras**, but to the inhabitants of the northern slopes they are nothing but plains or campos.

The campos are covered with grass and coarse herbage which afford pasturage for cattle; clumps of trees are dotted over the plains, giving them a park-like appearance, and broad river valleys intersect them. On account of the elevation the tropical heat is moderated. The open country is sunnier and drier than the selvas; hence the climate is healthy and exhilarating.

The **São Francisco** belongs entirely to the Brazilian highlands; it is navigable for about one hundred and thirty miles from its mouth to the **Paulo Affonso Falls.** On the plateau, two of its tributaries are connected with the Tocantins.

Productions.—In the sixteenth century gold was discovered in the districts of São Paulo; gold and diamonds in the province of Minas Geraes. Men were attracted to the State of Minas Geraes because of its mineral wealth, and it is now the most populous State in Brazil. The names **Minas** (mines), **Ouro Preto** (black gold), **Diamantina** (diamonds), all refer to the mining industry. Mining operations in Brazil are now of less economic importance than formerly. The chief wealth of Brazil is to-day derived from the forests, plantations, grasslands and rivers (for fish).

Rubber and **logwood** are obtained from the forests of the Amazon valley. **Cotton-growing** in Ceara and the neighbouring States developed rapidly during the American War of Secession (1861-5), because of the shortage of American cotton. Cotton-weaving is now an important industry in Brazil. All except the finer grades of cotton fabrics are now made in the factories of Brazil. **Sugar** and **tobacco** are grown extensively on the coast belt between Pernambuco and Rio de Janeiro. **Rice, manioc** (a plant from which tapioca is obtained) and **black beans** are cultivated on the fertile lowlands

of the Atlantic seaboard, and they form the staple food of the people.

W. S. Barclay, Geog. Jour

FIG. 108.—CABLE HOISTS, SAO PAULO RAILWAY, SERRA DO MAR, BRAZIL.

Coffee.—This shrub is extensively cultivated in the province of São Paulo, and coffee is exported from Rio de Janeiro and Santos. The coffee plant was introduced into Brazil in

1761, but it was not grown on a large scale until the nineteenth century. Nearly four-fifths of the world's supply of coffee now comes from Brazil.

The regions best adapted for coffee-growing are well-watered mountain slopes within the tropics, from one thousand to four thousand feet above sea-level, and having a mean annual temperature of 65°-70° F., as the plant is injured by frost. All these favourable conditions are found in São Paulo. The plants begin to bear fruit in the third year of growth, and in Brazil they are at their best when ten to fifteen years old, although they continue to yield fruit for more than thirty years. The fruit of the plant is a fleshy berry not unlike a small cherry, and each fruit contains two seeds embedded in a yellowish pulp. The fruit is placed in tanks of water until the fleshy portion is reduced to a pulp; the seeds are then taken out and dried, after which they are passed through rollers so that the parchment between the seeds may first be broken and then removed by winnowing. After this, the beans are graded according to size and quality, and packed in bags ready for export. The processes of roasting and grinding are usually done in or near the place of consumption, in order that the aroma of the coffee may be preserved. Railways were first constructed in Brazil to bring coffee to the coast for export.

Stock-breeding is of no great importance in Brazil, except in the province of Rio Grande do Sul.

History.—Brazil was discovered and settled by the Portuguese, **Bahia**, the first seat of government, being founded in 1549. When Portugal was invaded by the armies of Napoleon in 1808, the Portuguese Court removed from Lisbon to Rio de Janeiro, and Brazil became a monarchy under a Portuguese prince. In 1889 the Emperor Dom Pedro II. withdrew, and a republic was established. The territories of the republic are known as the United States of Brazil, and in area they are larger than either Europe or Australia. (The name Brazil is derived from a reddish dye-wood called *brasil* or *brisil*.)

People.—Men of Portuguese descent form the ruling class in Brazil, although they number only forty per cent. of the total population. The first white immigrants came from Portugal itself, but later colonists came from the Madeiras and Azores. In the middle of the sixteenth century, **negroes** were brought from Africa to work on the sugar plantations of the hot coast region. Although negroes were bought and sold as slaves, the Portuguese treated them with great humanity. The sharp contrast between master and slave in the cotton belt of the United States never existed in Brazil. Hence when slavery was gradually abolished (1871-88), no serious consequences followed as in the northern continent, and at the present time there is no political, or social, negro question in Brazil. The freed negroes are still labourers on the plantations; some have become gardeners and servants, while many have entered the Brazilian army.

Many Indian tribes live in the interior; those in the forests of the Amazon are very low in the scale of civilisation.

Towns.—Nearly all the large towns of Brazil are situated on the sea coast; this is partly due to the fact that the Portuguese made their first settlements on the coast; afterwards, when they went into the interior, the men engaged in agricultural and pastoral pursuits were naturally scattered over wide areas. The forests of the Amazon were unsuitable for European settlements, and so, except in the mining areas, few towns were established. The products of the interior were, however, brought to the coast for export; hence towns grew most rapidly at the ports where land traffic and sea traffic met.

Owing to the large number of freed slaves and to the enervating effects of the climate on the descendants of the early colonists, the old settlements on the coast lands in the north of Brazil have not progressed; some have declined in importance. Italian and German immigrants in the south have given an impulse to agricultural pursuits.

Rio de Janeiro (January River). De Souza discovered the harbour in 1532, and entering it on January 1st, and thinking

it was the mouth of a great river, he called it Rio de Janeiro. The bay is nearly land-locked, with granite mountains forming a fine background. It is the seat of government and a most important seaport.

Para commands the trade of the basins of the Amazon and Tocantins. Rubber and vanilla are the chief exports.

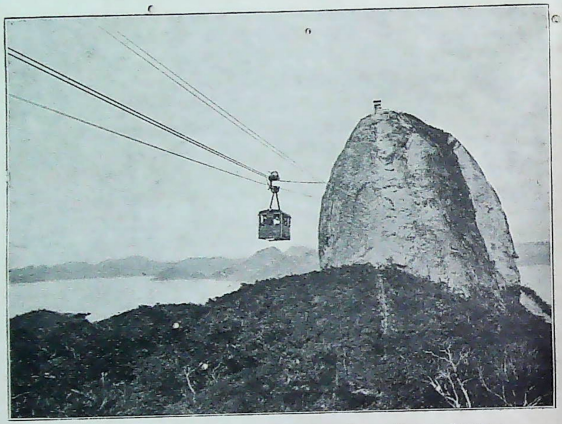


FIG. 109.—AERIAL ROPEWAY. THE SUGAR LOAF, RIO DE JANEIRO.
(By courtesy of the R.M.S.P. Co.)

Maranhao (San Luiz) was founded by a French adventurer and named in honour of St. Louis (1594). It is situated on an island; the coast lands opposite form a continuation of the forest zone of the Amazon plain, and above the forests are grasslands or savannas.

Pernambuco (or Recife = reef), the most easterly town in South America; it is an outlet for the cotton and sugar plantations. About 350 miles to the north-east is the island of **Fernando de Noronha**; it is of volcanic origin with reefs of coral round it; the island is used as a convict settlement.

Bahia.—The full name of this town was San Salvador da Bahia de Todos os Santos (Saint Saviour on the Bay of All Saints). Bahia was the first capital of Brazil, and it is still the ecclesiastical metropolis. Sugar, cotton and tobacco are exported.

Santos is the chief port of the province of São Paulo. Railways bring coffee to Santos for export.

Port Alegre, capital of Rio Grande do Sul, stands on a littoral lagoon. The district near it is noted for cattle-rearing.

Uruguay.—Physical Features. Uruguay belongs to the Brazilian mountain system rather than to the pampas formation of the Argentine. Spurs from the Brazilian uplands extend into Uruguay; these spurs, called **cuchillas** (= knives), appear as ridges of bare rock. The lowlands consist of gently undulating plains covered with magnificent pastures. The rivers find their way either to the **Lagoa Merim** or to the left bank of the **Rio Uruguay**. The streams which enter Lake Merim are not navigable, and in their lower courses they form shallow lagoons. The Rio Uruguay rises in Brazil not far from the coast, but it flows for a thousand miles to the Plate estuary; navigation is impeded by the cascade and rapids at **Salto** (= leap or fall).

Climate.—The climate is sub-tropical; in summer the temperature is high, but the heat is moderated by breezes from the Atlantic. The pamperos (page 292), accompanied by heavy rains and thunderstorms, often occur during the summer months.

The vegetation of Uruguay is somewhat similar to that of the Argentine, but the grasses are shorter and sweeter than those of the pampas. The grassy plains seem endless, except where trees along the streams, or round the **estancias** (or farmsteads), break the monotony of the landscape. Palms, bamboo, willows, poplars and other trees give shade to the herds during the great summer heat, but they are of little commercial value.

On the grasslands enormous herds of **horned cattle** are pastured; **sheep** are also kept, although they are smaller in

size than those in the Argentine and their wool is inferior in quality. **Horses** are of great use to the ranchers when rounding up their cattle. The **rhea**, the South American ostrich, is no longer found in a wild state, but like the ostrich in South Africa, it is now kept in farms.

Stock-raising.—Herds of cattle form the chief source of wealth of Uruguay, and the preparation of animal products is the most important occupation of the people. Hence the chief exports are: jerked [1] beef, frozen meat, tinned tongues, beef extracts, hides, tallow, and many other animal products. **Jerked beef** is largely consumed in Brazil and in other parts of South America; it is beef cut into long thin strips and dried in the sun, until all the juices are completely dried out of it; hence it is very tough and tasteless. **Ox tongues** are tinned in great numbers at Paysandu and Salto; as the climate is sub-tropical the tongues must be preserved where the cattle are killed; they cannot be carried far, especially as the curing is carried on in the summer when the cattle are in good condition after feeding on the spring herbage. The preserved tongues are then sent to Monte Video for export to Europe, where they are mostly consumed.

Extracts of meat are prepared in large quantities at Fray Bentos and other centres.

Agriculture is carried on on a small scale in the southern provinces, wheat, maize, tobacco, olive, wine and fruits being grown.

Minerals also occur in many places in the interior.

Seaports.—From Maldonaldo to the Brazilian frontier the coast is bordered by sand dunes, and there are few settlements. **Maldonaldo**, the port of Minas, a gold-mining town, has a better harbour than Monte Video, but it is less frequented as it is further away from the meat-packing centres.

Monte Video (mountain view) takes its name from the Cerro, or mountain which rises at the opposite side of the bay. The harbour or roadstead is shallow and exposed to the

[1] Jerked is a corruption of a Chilean word charqui (= dried beef).

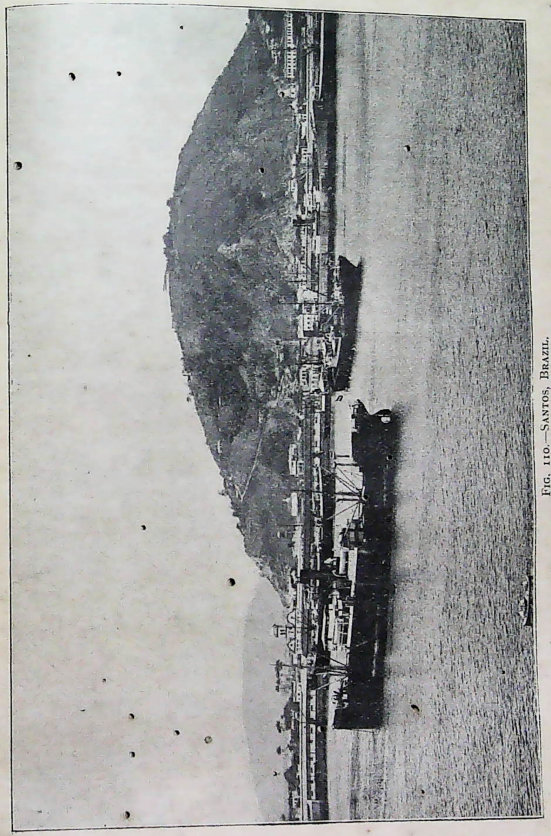


FIG. 110.—SANTOS, BRAZIL.
(By courtesy of the R.M.S.P. Co.)

South-east Trade Winds. Monte Video is the seat of government and the chief port of Uruguay.

People and History.—The inhabitants of Uruguay are mostly of European descent. Soon after the founding of Monte Video in 1717 by the governor of Buenos Aires, immigrants from the Canary Islands entered the country. More than seventy per cent. of the present inhabitants were born in Uruguay, and they all speak Spanish. There are a few Indians called **Gauchos**, who probably represent the earlier inhabitants. In 1828 Uruguay became free from Spanish rule, but political unrest has retarded the progress of the country. Uruguay takes its name from the River Uruguay. The official title of the republic is **La republica oriental del Uruguay** (the republic east of the Uruguay). The name **Banda Oriental** (east side) with reference to the river was also used some years ago.

EXERCISES.

1. Describe the Highlands of Brazil. What rivers rise in the Highlands ?

2. Write an account of a coffee plantation. How is coffee prepared for export ? From what Brazilian ports is it sent away ?

3. Why are nearly all the large towns of Brazil situated on the coast ? Name the five largest towns, and state the position and importance of each.

4. State the meaning of : Janeiro, Bahia, Brazil, Ouro Preto, Monte Video, Salto.

5. Say what you know of the following industries in Brazil : (*a*) agriculture, (*b*) mining.

6. " In the course of its history Brazil has been a Portuguese Colony, an Empire, and a Republic." State any facts which explain this statement.

7. Say what you know of the negro in Brazil.

8. What conditions in Uruguay are favourable to (*a*) cattle, (*b*) horses ? What animal products are largely exported ?

9. Describe the physical features and climate of Uruguay.

10. Write notes on the following : cuchillas, estancias, jerked beef.

11. In which part of Brazil have most railways been constructed ? What are the chief railway centres ?

12. In the subjoined table the exports and imports of Brazil and Uruguay, as regards trade with the United Kingdom, are given :

	Principal Articles exported to U.K.	Value £1000.		Principal Articles imported from U.K.	Value £1000.
From Brazil.	Rubber,	8,746	Into Brazil.	Cotton Goods,	2,575
	Coffee,	653		Woollen Goods,	350
	Cocoa,	269		Linen and Jute Goods,	628
	Sugar,	287		Coal and Coke,	1,454
	Fruit,	113		Machinery,	1,239
	Cotton, Raw,	1,029		Implements,	260
	Cotton Seeds,	219		Electrical Goods,	207
	Total Value,	11,804		Total Value,	12,836
From Uruguay.	Meat, Preserved,	702	Into Uruguay.	Cotton Goods,	682
	Beef,	299		Woollen Goods,	190
	Wool, Raw,	268		Coal and Coke,	725
	Rubber,	193		Iron and Steel Goods,	354
	Tallow,	152		Machinery,	136
	Total Value,	1,917		Total Value,	2,886

(*a*) Why are the articles sent from Brazil to the United Kingdom so different from those sent from Uruguay ?

(*b*) Why are the articles sent from the United Kingdom to Brazil so similar to those sent to Uruguay ?

LESSON XXXVII.

PLAINS OF ARGENTINA AND PARAGUAY.

1. In the subjoined table the exports and imports of the Argentine as regards trade with the United Kingdom are given. In the case of the exports :

(*a*) Rewrite the articles in order of value.
(*b*) Make a percentage table ; and
(*c*) Draw a diagram on squared paper (represent the total value of the exports by a column ten inches long).

Then treat the imports in a similar way.

Principal Articles exported from the Argentine to U.K.	Value £1000.	Principal Articles imported into the Argentine from U.K.	Value £1000.
Wheat,	7,020	Coal and Coke,	2,458
Oats,	1,647	Cotton Goods,	3,508
Maize,	6,467	Woollen Goods,	1,513
Flax Seed,	1,529	Iron and Steel Goods,	3,811
Beef,	9,699	Machinery,	1,782
Mutton,	2,385	Railway Carriages,	843
Meat (Salted),	987	Chemicals,	368
Tallow,	1,036	China Ware,	270
Hides,	604	Electrical Goods,	261
Wool, Raw,	1,842	Linen and Jute Goods,	530
Total Value,	34,461	Total Value,	20,595

2. Draw a sketch map of the Parana and its tributaries and mark the chief towns in the river basin.

3. Measure the distance by railway from Buenos Aires, (*a*) to Valparaiso, (*b*) to Asuncion, (*c*) to Salta.

4. On a map of the Argentine republic note the following :

(*a*) The networks of railway lines which radiate from Buenos, Rosario and Bahia Blanca respectively.

(*b*) The railway from Buenos Aires to Asuncion on the Paraguay, 927 miles. (The Parana estuary is crossed by train ferry, the route passes through Entre Rios near the River Uruguay, and on to Posados on the Parana, then by a second train ferry into Paraguay and so to Asuncion.)

(*c*) Buenos Aires to Valparaiso *via* Mendoza and Upsallata Pass, 894 miles ; the sea route from Buenos Aires to Valparaiso round Cape Horn, 2,700 miles.

(*d*) Rosario to La Quiaca on the Bolivian frontier *via* Cordova, Tucuman and Jujuy. (From La Quiaca a line 125 miles long is being constructed to connect the town with the Bolivian railway to La Paz, 1,722 miles from Buenos Aires.)

(*e*) Buenos Aires to Bahia Blanca ; branch from Bahia Blanca to Zapala, 115 miles west of Nequen on the Rio Negro.

On an outline map of the Argentine mark the routes given above. Indicate the international railways in red lines ; other railways in black lines.

The Pampas of Argentina.—The term *pampa* is a Quichua word for plain. In South America the word is usually restricted to the treeless, grassy plains of the Argentine which occupy most of the region between the Salado, a tributary of the Parana and the Negro on the border of Patagonia, and stretch eastward from the foothills of the Andes to the Atlantic seaboard.

The **Pampas** once formed the bed of an ancient sea ; the present surface, consisting of the finest alluvium, is nearly level, but it is slightly inclined to the Atlantic ; low ranges of hills such as the sierras of Tucuman, San Luis, Cordoba and others, relieve the monotony of the pampas. In the east the pampas are humid, fertile and grass-covered, but there are no trees. The chief feature is the tall coarse-leaved **pampas grass** with feathery spikes eight to nine feet high ; this grass covers large areas and seems to exclude other vegetation. **Alfalfa** or lucerne was planted by European settlers for hay and for green pasturage for fattening cattle.

In the west are the **sterile pampas** ; they are dry, sandy and almost barren, owing to the saline soils in which stunted trees and thorny bushes alone grow.

In summer the pampas are very hot and dry; droughts are very prevalent, and the country appears to be getting drier. **Pamperos** (pampas winds) are strong south-west winds which at first are very hot, but they gradually become cool and somewhat moist. In Buenos Aires these winds are experienced chiefly from October to January.

The Spaniards brought horses from Europe to the pampas, and now herds of wild horses roam over the plains; they are caught with the lasso by the **Gauchos** or other natives, men who are noted for their horsemanship, hardihood, and lawlessness. Sheep are now pastured in large numbers on the pampas, and they are usually owned by European settlers; hides, skins, wool and frozen meat are important articles of export.

The picturesque Gaucho is slowly disappearing in the eastern provinces; and the flocks and herds are being driven further inland. The rural population of the pampas is very sparse, and the **estancias** or farmsteads are of great size.

Agriculture and Railways.—Extensive tracts have been brought under the plough, and owing to the fertile soil and favourable conditions of climate, they now yield enormous crops of **wheat, maize** and other cereals, forage crops and fruit. The cultivation of crops has led to the fencing of the arable lands, to the employment of immigrant labourers, to the building of **railways**, and to the growth of market towns. In many parts, the construction of railways has often preceded the making of carriage roads; the alluvial soil of the plains provides no material for road metal; hence railways were easier and cheaper to make than roads. No tunnels or cuttings are required on the level plains, and the wear and tear of the rolling stock is much less than in a mountainous region. A network of railways radiate from Buenos Aires in all directions; there is now through railway communication from Buenos to Asuncion in Paraguay and to Santiago in Chile respectively. The railways have not only provided means of transport for the productions of the Argentine and international routes of importance, but they

have also been a powerful factor in bringing the distant provinces into closer union with the older States of the republic.

Entre Rios (=between the rivers) is a district between the Rivers Uruguay and Parana, and it is sometimes called

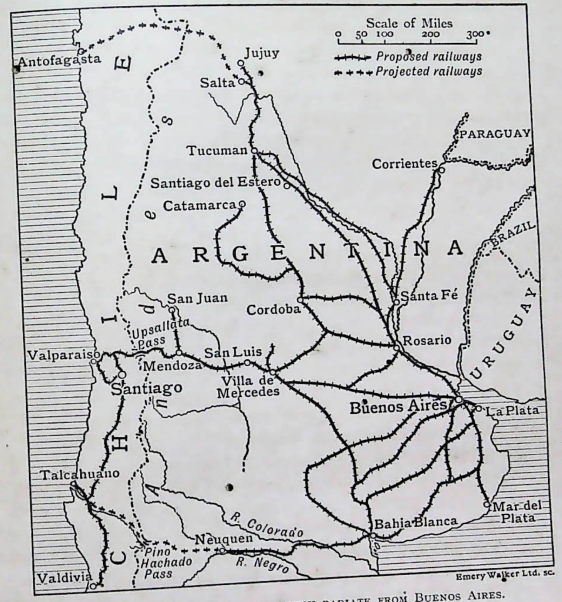


FIG. 111.—CHIEF RAILWAYS WHICH RADIATE FROM BUENOS AIRES.

the Argentine Mesopotamia. It is warmer and moister than the true pampas, and the streams which cross it are perennial, *e.g.* the Rio Guadaguay.

El Gran Chaco (=the great chase or hunting ground), in North Argentina, is distinguished from the pampas as grass

is replaced by coarse thorny scrub, palm groves, and in some parts dense woodland. Its position to the north of the pampas and across the Tropic accounts also for its hotter climate.

Parana.—This river rises in Brazil in the Sierra de Mantiqueira, and it receives many tributaries from the highlands of Brazil. In its upper course the Parana flows in a rocky gorge, and is useless for navigation. It reaches the frontier of Paraguay at the **Guayra Falls**, and it forms the boundary of that country until it joins the Rio Paraguay; from this confluence it turns south and only receives one perennial tributary, the **Salado** (= salt river). This tributary wanders across the Gran Chaco with a sluggish current; at certain seasons it overflows into lateral branches and into shallow lagoons, and when the floods have subsided its waters are brackish. The Salado joins the Parana at **Santa Fé**. From Santa Fé to **Rosario** the Parana is twenty-five to thirty miles wide, but it is broken by many long islands, of which **Delta Island** is noted for its peach trees. The estuary of the Parana is obstructed with banks of silt, but the main channel, known as the **Parana de las Palmas**, is accessible to large vessels, even in August when the water is lowest.

In the Rio de la Plata estuary, shoals and quicksands are constantly forming, so that dredging is needed to enable ships to approach Monte Video and Buenos Aires. From Monte Video to the opposite shore of the estuary is a distance of about sixty miles.

Patagonia.—The pampas extend southwards to the Rio Negro, beyond which they merge into the steppe region of Patagonia. This region consists of two terraces, one rising gradually from sea-level to a height of five hundred feet, the other forming a plateau (500-2,000 ft.) covered with **shingle** to a depth of fifty feet. The shingle was probably brought by glaciers which once reached the plateau from the Andes. Extensive areas are also covered with shifting dunes of coarse sand, especially in the Colorado and Negro basins.

The scenery of this steppe region is exceedingly monotonous, the general appearance being that of a desolate

desert. All the rivers flow to the Atlantic except a few which enter saline marshes and lagoons.

Settlement.—Owing to the hostility of the natives, the first attempt of the Spaniards to settle on the shores of the La Plata estuary failed, but in 1580 the town of Buenos Aires was founded. The development of the new colony was seriously hampered by the merchants of Cadiz and Seville, who feared that their monopoly of the colonial trade by Peruvian and Colombian routes would be interfered with. They therefore obtained a decree from the Spanish Government by which all merchandise should be sent to Buenos Aires by way of Peru over the Cordilleras and down the Paraguay. The commerce and government of the Argentine were both dependent on Peru until 1776, when the Argentine became a separate vice-royalty. The rule of Spain was abolished in 1810, and a federal republic was established.

Towns.—**Buenos Aires** (= good air), the largest city in South America and seat of the Argentine Government. It is the chief outlet for the commercial products of the Argentine and an important railway centre.

La Plata, a seaport.

Rosario, conveniently situated at the bend of the Parana; ocean-going steamers can reach it and goods can be shipped direct to Europe; hence it has become a rival of Buenos Aires. Rosario is the chief maize port of Argentina.

Santa Fé and **Parana** are on opposite banks of the Parana, near the Salado junction; the neighbouring districts are noted for agricultural produce, stock-raising, and fruit.

Corrientes (= currents) is fifteen miles below the confluence of the Parana and Paraguay; its name refers to the rapids due to projecting rocks. There is a regular service of steamers to Buenos Aires.

Cordoba is in a depression of an undulating plain surrounded by hills of moderate height; it is a centre of agriculture and stock-raising. Railways have brought renewed prosperity to the town, making it a centre of trade and industry.

Mendoza, one of the largest and finest cities in the Argentine, stands on a nearly level plain, on which wine-growing, stock-raising and mining are the chief occupations. The rainfall is only about six inches a year. The Trans-Andean railway passes through it on the way to the Upsallata Pass in the Cordilleras.

Catamarca, a copper-mining town.

FIG. 112.—LAKE NAHUEL HUAPI, IN THE PATAGONIAN ANDES.
A scene from the glaciated section of the Andes.

Tucuman, surrounded by farmsteads and plantations of sugar, coffee, maize, tobacco. The railway from Cordoba has increased its importance.

Jujuy, on the Bermejo, has transit trade with Bolivia.

Salta is situated in the valley of Lerma at an elevation of 3,790 feet; it also has trade with Bolivia.

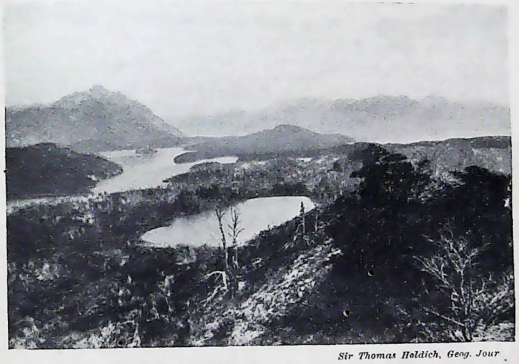
San Luis, on the Western Railway, is an intermediate town between plain and mountain; it is noted for mining, agriculture, stock-raising.

Bahia Blanca (white bay), a naval and military town, has a deep harbour suitable for large vessels. Since 1912 the

wheat centre of the Argentine has shifted southwards, and much more wheat is now shipped from Bahia Blanca than from Rosario.

Port Madryn, a Welsh colony, founded in 1865 on the Golfo Nuevo, is connected by rail with Trelew and Rawson on the Chubut.

Falkland Islands.—The Falkland Islands belong to Great



Sir Thomas Holdich, Geog. Jour

Britain; they are of some importance to the whalers and seal-hunters of the southern seas, and as a calling station for ships passing round Cape Horn.

The Falkland Islands rise from the continental shelf, and they consist of two large islands fringed by many reefs, rocks and islets. The coasts are low and much indented; and the surface is rugged and hilly, and includes extensive moorlands. The climate is equable and healthy; rain falls on nearly every day in the year, but the total rainfall is only about thirty inches. Fierce gales sweep over the islands, and when the weather is calm, mists often cover them. There are no

trees on the islands, but tussock grass grows in clumps and is used for fodder and for hay. Sheep are the chief wealth of the colony, and wool, frozen mutton and tallow are exported.

Stanley, the chief town, is on a harbour nearly landlocked in East Falkland.

South Georgia, a dependency of the Falkland Islands, has no permanent inhabitants. It is a cold, inhospitable land with snowy peaks from which glaciers descend to sea-level. The low parts of the island are covered with tussock grass.

Paraguay.—Paraguay, a country enclosed on all sides by land frontiers, takes its name from the Rio Paraguay, the great tributary of the Parana. The Rio Paraguay has its source a thousand feet above sea-level on the Matto Grosso of Brazil; its head-waters are connected with the Tapajos, and its tributary, the Jauru, has been joined by a canal half a mile long to the Alegre, an affluent of the Madeira. There is therefore no well-defined water-parting between the Paraguay and the tributaries of the Amazon. The Paraguay is a slow-flowing river, and it is navigable for some distance beyond the Brazilian frontier.

Western Paraguay, or Chaco, is a level stretch of country of great extent between the Paraguay and Pilcomayo, and is subject to periodic inundations. As the mean altitude is less than five hundred feet, the drainage is poor, and after the floods have subsided the soil is left wet and unhealthy. During the hot summer months, great evaporation takes place and salt lakes are formed in the depressions. Some parts of Western Paraguay have not yet been explored.

Eastern Paraguay is situated between the Paraguay and Parana; it consists of upland country crossed by a low range of densely wooded hills; the hills are locally called the **Forest Range** (Sierra de los Montes). Large open tracts of undulating country provide pasturage for horned cattle; the herbage is too coarse and the climate is too hot for sheep. The alluvial soils are very fertile, and on them are grown yerba maté (p. 299), oranges, tobacco, sugar-cane and other crops.

Climate.—Paraguay is crossed by the Tropic of Capricorn; it is a low-lying country shut off from the moderating influence of the Atlantic Ocean by the Brazilian highlands; hence its climate is hot and dry. In the winter months the average temperature is 60° F., and the thermometer occasionally falls as low as 40° F. The pamperos, which blow from the south-west, are cool and refreshing. Most rain falls in August, September and October, but in the other months of the year the rainfall is scanty.

Productions.—The forest trees yield timber noted for hardness and durability; and articles of commercial value are obtained from the palms, rubber trees and dye-woods. Among the cultivated crops **yerba del maté** takes the first place in importance; this plant is not strictly a herb, as its name implies, but a shrub or tree which is indigenous to Paraguay. The Jesuit priests encouraged the people to cultivate the shrub on large plantations called **yerbales**, and many labourers are needed to gather the leaves. The word maté means **calabash**, a vessel which serves the purpose of a teapot; hot water is poured on the leaves, and when the infusion is cool it is sucked up through a tube. This tea is said to act as a tonic and stimulant to the people who drink it without causing any ill effect afterwards.

The Jesuits also encouraged the cultivation of **oranges** and **lemons**. Orange groves abound, and on account of the climate they provide a continuous supply of fruit. The oranges of Paraguay are said to be more fragrant and luscious than those of Valencia or Italy.

People and Towns.—In 1536 the Spaniards entered the country, and after a struggle lasting some years, they subdued the natives, known as **Guaranis**. The word Guarani probably means warrior, and before the arrival of the Spaniards the Guaranis had shown their warlike spirit by conquering the surrounding tribes. Under Spanish rule and under the influence of the Jesuits they showed themselves to be gentle and docile, and they more readily adopted Christianity than any other Indians in South America. The Guarani language

is now spoken over a very large area, and it is used by many other tribes of Indians as a general medium of discourse.

Asuncion, on the left bank of the Rio Paraguay, is the capital; it was founded by the Spaniards in 1536. It has considerable river traffic.

Luque is noted for orange and banana groves.

Villa Rica, an old Jesuit foundation. It is the centre of a fertile district which is irrigated for the manioc and tobacco plantations.

EXERCISES.

1. Describe the pampas of the Argentine as regards scenery and occupations of the people.

2. What conditions have favoured the construction of railways in the Argentine?

3. (*a*) Why do so many railways focus at Buenos Aires? (*b*) Describe the railway route from Buenos Aires to Santiago.

4. Describe the estuary of the Parana, and point out the importance of the towns on the estuary.

5. Write notes on the following: (*a*) Patagonia, (*b*) Entre Rios, (*c*) Gran Chaco.

6. How were goods sent from Europe to Buenos Aires, (*a*) when the Argentine was under the government of Peru? (*b*) after 1776, when the Argentine became a separate colony?

7. Say what you know of the pamperos, Gauchos, Salado, Delta Island.

8. In the subjoined table the chief towns of the Argentine Republic are given. State the position and importance of each town.

Towns.	Population 1000.	Towns.	Population 1000.
Buenos Aires, - -	1,660	Mendoza, - - -	62
Cordoba, - - - -	135	Bahia Blanca, - -	75
Rosario, - - - -	234	Parana, - - - -	65
La Plata, - - -	106	Santa Fé, -	40
Tucuman, - - - -	66	Salta, - - - -	38

9. The area of the Argentine Republic is 1,153,000 sq. miles and the total population is 7,970,000. What percentage of the total population lives (*a*) in Buenos Aires? (*b*) in the ten towns taken together?

10. Of what two parts does Paraguay consist? Describe the physical features of each.

11. State clearly the position of Paraguay, and show that the climatic conditions of the country depend to some extent on its position.

12. Say what you know of yerba del maté. What other articles of value does Paraguay produce?

APPENDIX.

ADDITIONAL EXERCISES.

Draw a diagram similar to Fig. 71 to show temperature and rainfall for each of the towns in the subjoined Tables.

TEMPERATURE AND RAINFALL.

Month.	Toronto 43½°N.				Montreal 45½°N.			
	Mean Temp.	Rain.	Snow.	Total Precipitation.	Mean Temp.	Rain.	Snow.	Total Precipitation.
	F.	In.	In.	In.	F.	In.	In.	In.
Jan., -	22·1	1·14	17·3	2·87	12·7	0·85	31·4	3·99
Feb., -	21·7	1·93	16·5	3·58	14·3	0·72	26·1	3·33
March, -	29·0	1·50	11·5	2·65	24·6	1·45	19·5	3·40
April, -	41·4	2·15	2·5	2·40	41·3	1·69	5·3	2·22
May, -	52·7	2·97	0·1	2·98	52·9	3·01	0·1	3·02
June, -	62·6	2·76	—	2·76	63·9	3·21	—	3·21
July, -	68·1	3·04	—	3·04	69·1	3·95	—	3·95
August, -	66·6	2·77	—	2·77	66·1	3·35	—	3·35
Sept., -	59·2	3·18	—	3·18	58·5	3·46	—	3·46
October,	47·0	2·40	—	2·40	46·0	3·13	1·4	3·27
Nov., -	36·3	2·45	4·6	2·91	33·3	2·26	11·7	3·43
Dec., -	26·3	1·53	13·0	2·83	19·6	1·17	25·2	3·69
Year, -	44·4	27·82	65·5	34·37	41·8	28·25	120·7	40·32

TEMPERATURE AND RAINFALL.

Month.	Edmonton (Alberta) 54°N.				Prince Albert (Sask.) 53°N.			
	Mean Temp.	Rain.	Snow.	Total Precipitation.	Mean Temp.	Rain.	Snow.	Total Precipitation.
	F.	In.	In.	In.	F.	In.	In.	In.
Jan., -	6·5	0·04	6·5	0·69	−4·1	0·00	8·8	0·88
Feb., -	9·2	0·01	7·1	0·72	−2·1	0·02	7·2	0·74
March, -	22·4	0·06	6·7	0·73	12·3	0·08	8·7	0·95
April, -	40·8	0·45	3·4	0·79	37·1	0·38	4·5	0·83
May, -	51·4	1·65	1·3	1·78	49·4	1·42	1·1	1·53
June, -	57·1	3·09	0·1	3·10	57·4	2·63	—	2·63
July, -	61·0	3·05	—	3·05	61·8	2·44	—	2·44
August, -	59·2	2·04	0·1	2·05	58·9	2·40	—	2·40
Sept., -	49·8	1·38	0·8	1·46	48·9	1·41	0·8	1·49
October,	47·8	0·40	3·5	0·75	38·1	0·62	2·7	0·89
Nov., -	28·6	0·06	6·8	0·74	17·6	0·13	9·1	1·04
Dec., -	18·9	0·07	7·0	0·77	5·0	0·01	7·8	0·79
Year, -	37·7	12·30	43·3	16·63	31·7	11·54	50·7	16·61

Month.	Quebec 47°N.				St. John N.B. 45°N			
	Mean Temp.	Rain.	Snow.	Total Precipitation.	Mean Temp.	Rain.	Snow.	Total Precipitation.
	F.	In.	In.	In.	F.	In.	In.	In.
Jan., -	9·7	0·64	30·7	3·71	19·2	2·66	21·4	4·80
Feb., -	12·0	0·74	27·3	3·47	20·0	1·98	19·2	3·90
March, -	22·8	1·29	19·9	3·28	28·4	3·07	14·7	4·54
April, -	37·0	1·42	6·4	2·06	39·1	2·89	6·2	3·51
May, -	52·0	3·01	0·4	3·05	47·7	3·68	0·3	3·71
June, -	61·2	3·83	—	3·83	56·4	3·27	—	3·27
July, -	66·1	4·30	—	4·30	60·4	3·63	—	3·63
August, -	62·8	4·00	—	4·00	60·7	3·86	—	3·86
Sept., -	55·3	3·77	—	3·77	55·9	3·74	—	3·74
October,	42·0	2·94	1·5	3·09	45·4	4·49	0·5	4·54
Nov., -	32·2	1·75	14·2	3·17	36·6	3·88	5·3	4·41
Dec., -	15·0	0·85	25·2	3·37	24·4	2·83	13·4	4·17
Year, -	39·0	28·54	125·6	41·10	41·2	39·98	81 0	48·80

TEMPERATURE AND RAINFALL.

	Bogota (8,643 ft.)		La Paz (12,000 ft.)		Georgetown (sea-level)	
	F.	In.	F.	In.	F.	In.
January,	57·6	3·7	51·6	3·9	78·4	7·6
February,	57·9	3·5	51·3	4·5	78·4	5·7
March,	58·6	4·5	50·7	2·6	79·0	5·7
April,	58·6	9·6	49·1	1·5	79·5	6·5
May,	58·5	6·5	46·9	0·5	79·3	10·9
June,	58·1	3·2	44·1	0·1	78·8	12·0
July,	57·2	2·6	44·6	0·2	79·0	9·7
August,	57·0	3·3	45·9	1·1	79·7	6·7
September,	57·0	2·9	48·4	0·8	81·0	2·7
October,	57·9	8·4	50·4	1·3	81·1	2·4
November,	58·3	9·6	52·7	1·5	80·4	5·7
December,	58·1	5·6	52·1	4·3	79·0	11·3

	Rio Janeiro (sea-level)		Asuncion (340 ft.)		Catamarca (1,170 ft.)	
	F.	In.	F.	In.	F.	In.
January,	77·5	4·8	80·1	6·8	82·0	3·0
February,	78·1	4·4	80·1	5·4	79·5	2·6
March,	77·1	5·1	78·6	6·1	76·7	2·0
April,	74·1	4·6	72·3	5·8	66·9	0·7
May,	70·7	3·7	66·0	4·4	60·1	0·5
June,	68·1	1·9	61·0	2·9	49·8	0·2
July,	67·5	1·7	64·8	2·4	55·0	0·0
August,	68·7	1·9	67·1	1·8	61·0	0·1
September,	69·4	2·3	68·2	3·5	68·3	0·3
October,	71·2	3·1	73·2	5·5	72·3	0·6
November,	73·4	4·3	78·8	5·9	77·5	1·4
December,	74·8	5·6	80·6	5·2	81·0	1·3

Altitude of the Sun.

In Fig. 113 BC, BD, BF receive the same number of rays. BC, drawn at right angles to the rays, is less than BD or BF. It is evident, therefore, that the intensity of the sun's rays will be greatest on an area represented by BC; and it is also evident that the intensity depends on the angle which the sun's rays make with the surface; this angle is the altitude of the sun.

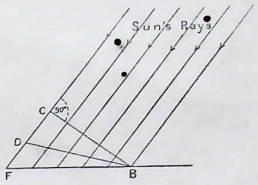


FIG. 113.—INTENSITY OF SUN'S RAYS.

In countries outside the Tropics, the only case in which the sun's rays can be perpendicular to the surface of the land is when BC represents the southern slope of a mountain.

The altitude of the sun on any day in the year may be found by subtracting the latitude from 90°, and then adding the declination of the sun when the sun is north of the equator and subtracting when the sun is south. (The declination of the sun is its angular distance north or south of the celestial equator; at the equinoxes, March 21st and September 23rd, the declination is 0; at the solstices the declination is $23\frac{1}{2}°$; for the declination on other days in the year reference should be made to Whitaker's *Almanac*.)

The altitude of the sun at Montreal (lat. $45\frac{1}{2}°$ N.) on June 22nd

$$= 90° - 45\tfrac{1}{2} + 23\tfrac{1}{2} = 68°.$$

The altitude of the sun at Montreal on December 21st

$$= 90° - 45\tfrac{1}{2} - 23\tfrac{1}{2} = 21°.$$

These angles are shown on the diagram, Fig. 114; it should be noted (*a*) that the direction of the sun's rays for any day in the year will fall between those shown on the diagram; (*b*) that the sun appears to move through an angle of $(68° - 21°) = 47°$ or twice $23\frac{1}{2}°$; (*c*) that the sun never shines vertically at Montreal.

The altitude of the sun at Georgetown (British Guiana), lat. 6° N., is $107\frac{1}{2}°$ at the summer solstice and $60\frac{1}{2}°$ at the winter solstice; hence in the course of the year, the sun will pass the vertical position twice (note the dotted line on the diagram).

Draw diagrams to show the altitude of the sun at the solstices at Dawson City (latitude 64° N.), Vera Cruz ($19\frac{1}{2}°$ N.), Santiago ($33\frac{1}{2}°$ S.), Denver (40° N.).

At what angle would the side of a mountain (situated in the latitude of Denver) have to slope for the sun's rays to be perpendicular to it at noon on June 22nd?

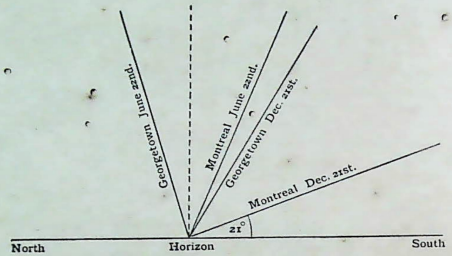


FIG. 114.—ALTITUDE OF THE SUN AT THE SOLSTICES FOR MONTREAL AND GEORGETOWN.

Variation of Day and Night.

The diagram, Fig. 115, shows the length of day and night for any place on the earth's surface at the winter solstice. Quebec and Valparaiso are on the same meridian of longitude (71° W.).

At the winter solstice the sun is vertical on the Tropic of Capricorn. In the diagram the point B is on Capricorn. A line drawn from the centre of the earth through B gives the direction of the sun's rays vertical to the surface of the earth at B. As the earth turns on its axis in 24 hours, every point on Capricorn must pass through B (that is, at noon).

A plane (passing through the centre of the earth) at right angles to the direction of the sun's rays, will divide the earth's surface into hemispheres, one light and the other dark. Hence the broken lines in the circles show the length of the night; the unbroken lines the length of day. It should therefore be noted that at the winter solstice (December), Quebec being in the northern hemisphere has a short day and long night; Valparaiso being in the southern hemisphere has a long day and short night.

From the diagram find roughly the length of day and night at the winter solstice for Quebec and Valparaiso; also for places on the Tropics, the Arctic Circles and the Equator.

Point out on the diagram where these places will have sunrise, sunset, noon and midnight.

Draw similar diagrams for the equinoxes and the summer solstice.

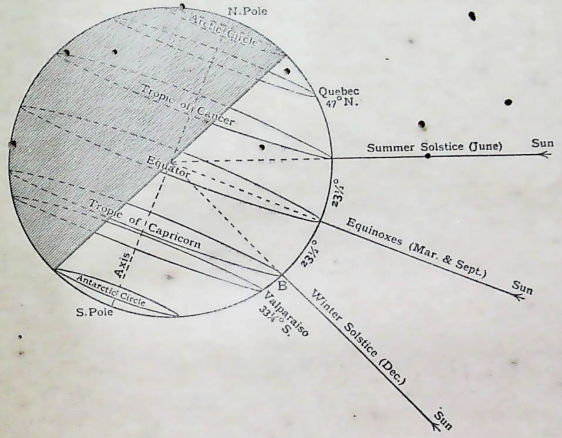


FIG. 115.—LENGTH OF DAY AND NIGHT AT THE WINTER SOLSTICE.

Apparent Path of the Sun.

The apparent path of the sun throughout the year for an observer at St. John's (Newfoundland), latitude 47½° N. (Fig. 116).

The circle represents the celestial sphere. O is the position of the observer in latitude 47½° N.; ESWN is the horizon.

Since the altitude of the North Pole Star is the same as the latitude, measure from N on the horizon, 47½°, and mark the North Pole Star. Draw a line through the centre. A circle drawn on a plane at right angles to this axis will give the path of the sun at the equinoxes. The other circles are drawn 23½° on either side of this one, as in the diagram.

The part of the sun's path above the horizon (an unbroken line) represents the day; the path below the horizon (the broken line) represents the night.

On any day of the year, therefore, the sun rises on the east side of the horizon; it reaches its highest point above

the horizon B (noon) and then sets on the west side of the horizon.

The variation of day and night throughout the year can be seen on the diagram.

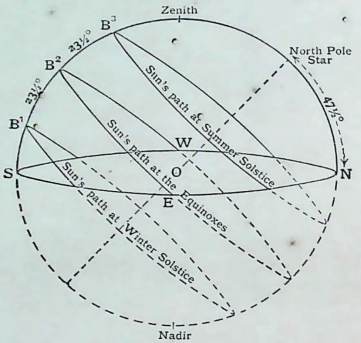


FIG. 116.—APPARENT PATH OF THE SUN FOR LAT 47½° N. (ST. JOHN'S).

Draw similar diagrams for observers on the Equator (latitude 0); on the Tropic of Cancer (23½° N.); on the Arctic Circle (66½° N.); at the North Pole (90° N.).

Draw a diagram to show the path of the sun for an observer at Rio de Janeiro.

SELECTED EXAMINATION QUESTIONS.

THE examination questions are selected from papers in Geography set in recent years. Permission to print the questions has been kindly given by the following authorities: The University of London; the Controller of H.M. Stationery Office; the Oxford Delegacy; the Cambridge Syndics for Local Examinations; and the Council of the College of Preceptors.

The following abbreviations are used: L.M., London Matriculation and Senior Schools; L.J., London Junior Schools; C.S.C., Civil Service Commission; O.S., Oxford Senior; O.J., Oxford Junior; C.S., Cambridge Senior; C.J., Cambridge Junior; C.P., College of Preceptors.

CANADA.

1. Give a description of the route of *either* the Canadian Pacific Railway *or* the Grand Trunk Pacific Railway, including in your description the character and relief of the country traversed. Give the name and position of the terminus on the Pacific, and name two other important towns on the system, and the pass by which it crosses the Rockies. (C.S.)

2. Name one Canadian river which flows into the Atlantic, one which flows into the Arctic, and one which flows into the Pacific. Describe briefly the nature of the country traversed by each,—as mountain or plain; forest, grassland, or desert. Place these rivers in the order of their usefulness for navigation, and give reasons for the order in which you place them. (C.J.)

3. What do you understand by "The Dominion of Canada"? What route would you take if you wished to travel from England to Manitoba? How could you go on to India without coming back to England? (C.P.)

4. Describe the journey of a steamer from Fort William to Montreal. What obstacles necessitated the construction of canals as part of the waterway? (L.J.)

5. Choose two of the following provinces of Canada: (*a*) Quebec, (*b*) Saskatchewan, (*c*) British Columbia.
In each case write an account of the physical features, productions and towns. (L.J.)

6. Draw a sketch map of the Great Lakes drained by the River St. Lawrence. Indicate on your map the positions of the Niagara Falls, the Welland Canal, the chief iron-mining district, five large lake ports, and the approximate positions of the State of Pennsylvania and the Erie Canal. (L.M.)

7. Write notes on two of the following: (*a*) the Banks of Newfoundland; (*b*) Hudson Bay; (*c*) the Fraser Valley. (L.J.)

8. What provinces are included in the Dominion of Canada? How is the Dominion governed? Give a short account of the southern boundary of Canada. (C.S.C.)

9. If you were emigrating from London to mid-Canada, (*a*) To what town or province would you go? (*b*) What route would you choose? (*c*) About how long would your journey take? (*d*) What occupation would you expect to follow at your journey's end? Give reasons for your answers. (C.P.)

10. How does the climate of Canada vary as we cross from east to west? What are the chief products of (*a*) Ontario, (*b*) British Columbia? (C.P.)

11. A man travels from Montreal to Vancouver by the Canadian Pacific Railway. Describe briefly the districts he would pass through as regards scenery and occupations of the people. (C.S.C.)

12. Give some account of the cod and herring fisheries off the Atlantic coast of North America. What towns are connected with the industry? (C.S.C.)

13. Contrast and account for the climates of the East and West coasts of Canada. (C.S.)

14. In what parts of Canada are wheat and fruit grown respectively? In each case state the conditions which favour the production, and mention the routes by which these articles are exported. (L.J.)

15. Give an account of the mineral resources of the St. Lawrence Basin. Mention the most important manufacturing industries, districts, and towns in this territory. Illustrate your answer by a sketch map. (C.S.)

16. What important railways meet at Winnipeg? What advantages does Winnipeg possess as a railway centre? (L.J.)

17. In what parts of British North America are the following industries carried on: fishing, gold mining, lumbering, cattle ranching? In each case state briefly the conditions under which the work is done. (L.J.)

UNITED STATES.

1. Divide the United States east of the Rocky Mountains into natural regions.
Describe and account for the climate of the south-east States, and show how far it determines the chief products of the region. (O.S.)

2. Name, in order from north to south, the chief ports of the east coast of the United States of America. Describe the position of each, and show in what way its growth has been due to its position. (C.S.)

3. Describe the physical character of the coastal region of the United States between Florida and the Bay of Fundy, and show how it has influenced the progress of colonisation and subsequent development of the country. (C.S.)

4. Give reasons for the facts stated in any *three* of the following sentences:
(*a*) The New England States manufacture textiles.
(*b*) California is noted for fruit-growing.
(*c*) High tides occur in the Bay of Fundy.
(*d*) There are many salt lakes in the Great Basin. (L.J.)

5. Choose three of the following:
(*a*) Pittsburg—a great centre for iron work.
(*b*) Chicago—for meat packing.
(*c*) Lowell—for textiles.
(*d*) Minneapolis—for flour mills.
In each case give the position of the town, and explain why the industry has developed at that particular place. (L.J.)

6. New York is in longitude 74° W.; San Francisco is in longitude 122½° W. What time is it at San Francisco when it is 2 p.m. at New York? Explain how you arrive at the result. (C.S.C.)

7. Describe the Alleghany Plateau, and state (or show by a sketch) its relation to (*a*) the Great Appalachian valley, (*b*) the "blue grass" region of Kentucky, and (*c*) the head streams of the Ohio river.
Give some account of the mineral resources of the plateau. (O.S.)

8. What are the chief natural obstacles to communication between the Atlantic coastal plain and the interior of North America? In what states is the separation most complete? How has this isolation affected the population and industries of these states? (O.J.)

9. State (i) what natural advantages made San Francisco the great port of the western coast of the United States; and (ii) what are the regions of North America in which the following commodities are produced in large quantities: tobacco, timber, wheat, cheese, silver? (C.J.)

10. Write a descriptive account of the Mississippi-Missouri Basin, under the following heads: (i) Physical Features (*elevation and river systems*), (ii) Climate, (iii) Agricultural Products. (C.J.)

11. Describe the position and extent of the Appalachian Coalfield. Give an account of the industries connected with this coalfield. What other coalfields are there in the eastern part of North America? (C.S.C.)

12. Describe briefly the following railway routes:
(*a*) New Orleans to San Francisco.
(*b*) New Orleans to New York. (L.J.)

13. The coast region of North America north of New York is quite different in type from that south of New York. What are the chief differences? (O.J.)

14. Say what you know of the waterways of North America, and explain their commercial importance. (L.J.)

15. Contrast the climate and vegetable productions of the eastern coast region of the United States with those of the western coast. (C.P.)

16. Write notes on two of the following, and draw sketch maps to illustrate the answers: (*a*) the Ohio Valley, (*b*) Puget Sound, (*c*) the State of Virginia. (L.J.)

17. State the position of Philadelphia, Boston and New York. Compare the commercial importance of these ports with reference to the exportation of the products from the west. (L.J.)

18. In crossing North America from New York to San Francisco, what would be the typical products and occupations that you would find at successive stages of the journey? What are the geographic conditions that determine each? (L.M.)

19. Give some account of the characteristics of the main stream of the Mississippi and of its chief tributaries. (L.M.)

20. Compare the climatic conditions which prevail on the Pacific coast belt of the United States of America from those which prevail on the Atlantic coast belt; distinguish carefully the winter and summer climates. (L.J.)

21. Give some account of the manufacture of textiles in Massachusetts and the adjacent States. Explain why the district is suitable for the textile industries; mention the chief centres of manufacture, and say from what sources the raw materials are obtained. (C.S.C.)

22. Give the exact situation and extent of (*a*) the Prairie region, (*b*) the cotton-growing region, and (*c*) the very dry region of this continent. Explain the cause of the peculiar climate of one of these districts. (C.P.)

23. Describe two of the following: (*a*) the Hudson-Mohawk Valley, (*b*) the Vale of California, (*c*) the Appalachian Highlands. (L.J.)

24. The Meridian 100° W. is approximately a dividing line between two distinct economic regions of the United States of America. Compare and contrast these regions as regards (i) climate, (ii) products. How far is this division applicable in Canada? (O.S.)

25. Show broadly how the geographical conditions have determined the distribution of population in the United States of America. (L.M.)

26. Give the position and trade importance of: New York, Galveston, St. Louis, Philadelphia. (L.J.)

27. Explain what is meant by the "Fall line" in the Atlantic region of North America. What is its commercial importance? Give illustrations. (O.J.)

28. What do you understand by any *four* of the following?—a Yellowstone Geyser, the Fall line, the Colorado Cañon, the Niagara Whirlpool, Long Island, the Yosemite Valley. Locate each you choose, and account for its formation. (C.P.)

29. Compare the course of the Mississippi and Missouri from their sources to their junction near St. Louis. Describe the country through which the Mississippi flows from St. Louis to New Orleans. (L.J.)

30. When it is noon at Greenwich, it is 5 o'clock in the morning at Denver (U.S.A.). Find the longitude of Denver. (C.J.)

31. Give the position of Chicago, New Orleans, San Francisco, Pittsburg. In each case point out why an important city has grown up at that particular place. (L.J.)

32. Describe the coastal plain of the Gulf of Mexico from Florida to the Rio Grande, with special reference to climate and productions. (L.J.)

33. Draw a sketch map of the Erie canal. Point out its chief uses, and show how its construction has benefited New York. (C.P.)

34. Describe the Atlantic coast of the United States of America. Mention three seaports, and give an account of the trade of each. (L.J.)

35. Write short notes on the following regions, with special reference to climate and productions: Florida, Nova Scotia, Alaska. (L.J.)

36. Into what natural regions may the United States of America be divided? State the chief features of each region. (L.J.)

MEXICO, CENTRAL AMERICA, WEST INDIES.

1. What is the character of the climate of Mexico? How does it vary in different parts? What are the chief productions of the different regions? (C.P.)

2. How does the surface configuration of Mexico influence its climate, products, and industries?
Give an account of the chief mineral products, the railway system, and the principal seaports of Mexico. (O.S.)

3. Draw a map of Central America, showing the rivers, towns, and boundaries of states. The names of the rivers, towns, and states must be inserted. (C.S.)

4. (i) Explain briefly the political and commercial importance of the Panama Canal; (ii) State what are the chief industries of Mexico, and who are its inhabitants. (C.J.)

5. The islands of the West Indies form four natural groups. Give the names and describe the relative positions of these groups, mentioning *one* important island in each.
Where are the "Windward" islands? Why are they so called? (O.S.)

6. In the case of each of the following: Cuba, Haiti, Nicaragua, Jamaica, Martinique, indicate (i) as exactly as you can its position; (ii) name the power which controls it; (iii) name one chief town; (iv) state the principal export. (C.J.)

7. Say what you know of the following West India Islands as regards position, climate and productions: Trinidad, Jamaica, Barbados. (L.J.)

8. Name the British possessions in the West Indies, and describe briefly their positions. (C.S.)

SOUTH AMERICA.

1. Draw two outline maps of South America, and in both mark the position of the Equator and the Tropic of Capricorn. In one of these maps indicate broadly the distribution of the annual rainfall, and in the other the distribution of forest, grassland, and desert. (C.S.)

2. Describe briefly the course of the river Amazon, and name its chief tributaries, and state what vegetable products of economic value are found in the Amazon valley. (C.J.)

3. What are the chief productions of the Pacific slope of South America? Draw a sketch map of this coast, and indicate the chief areas for the production of each of the products you have mentioned. Indicate on the map, by arrows, the direction of the prevalent winds experienced off various parts of the coast and, by shading, the areas of heavy rainfall. (L.M.)

4. Show that the people who live in the Argentine have been influenced by their environment as to their occupations and mode of life. (L.J.)

5. Describe the position of: Peru, British Guiana, and Uruguay. In each case show that the occupations of the people have been determined to some extent by the physical features of the country. (L.J.)

6. In what ways is commerce helped or hindered by natural peculiarities in South America? Illustrate each statement you make by reference to some country. (C.S.)

7. Six of the largest towns of South America are the following: Buenos Aires, Rio Janeiro, Para, Santiago, Monte Video, Valparaiso. To what circumstances do you attribute the existence of large towns at these places?
How is it that in the Amazon valley there is only one town (Manaos) of over 10,000 inhabitants? (C.S.C.)

8. Write an account of two of the following:
(*a*) The Trans-Andean Railway.
(*b*) The desert of Atacama.
(*c*) The agricultural resources of Brazil. (L.J.)

9. From what parts of Central or South America does Great Britain import (*a*) mahogany, (*b*) nitrates, (*c*) rubber, (*d*) sugar, (*e*) wheat ? (C.S.)

10. Draw a sketch map of one of the following :
(*a*) The coffee region of Brazil.
(*b*) The " meat " towns of Argentina and Uruguay.
(*c*) The Trans-Andine railway. (C.P.)

11. Give the position and a very brief description of the Falkland Islands, Tierra del Fuego, the Isthmus of Panama, Lake Titicaca, and the Llanos of Venezuela. (C.J.)

12. Divide the Pacific seaboard of South America into climatic regions. Describe clearly the climate of each division. (L.J.)

13. Describe the physical conditions which prevail : (*a*) in the plains of the Argentine (the Pampas), (*b*) in the basin of the Amazon (the Selvas).
Show what effect these conditions have had as regards European settlement and commercial development. (C.S.C.)

14. Give in order, commencing on the North East, the names of the countries bordering Brazil. Add the name of the capital city of each, and of any important river flowing through the country, or separating it from Brazil. (C.P.)

15. Nearly all the large towns of South America are on or near the coast. Explain clearly why this is so.
Choose two large towns on the Atlantic seaboard of South America and two on the Pacific coast, and say under what circumstances they have become important. (L.J.)

16. State as fully as you can the reasons why the Atlantic slope of South America is of much greater commercial importance than the Pacific slope. (L.M.)

17. Define the position and state what you know of any *six* of the following : El Gran Chaco, Galapagos, the Kaieteur Falls, the Pampas, Port Stanley, Roraima, the Great Shingle Desert, Titicaca. (C.S.)

18. What do you understand by the following, and state where each is to be found ?—Culebra cutting, savannas, Cassiquiare, cinchona, yerba-maté, selvas, llamas. (C.P.)

19. Describe a coasting voyage from Guayaquil to Buenos Aires, naming the countries passed on the way and describing the general character and aspect of the coasts. Name four ports and three islands passed on the way, indicating the position of each. (C.J.)

20. Write a short account of the extent and direction of the main railway lines of the Argentine Republic, and point out how : (*a*) the configuration, climate and products of the country, (*b*) the position of the ports, have controlled the development of the railroad system. (L.M.)

21. What parts of South America chiefly produce (*a*) wool, (*b*) india-rubber, (*c*) cocoa (cacao), (*d*) sugar, (*e*) coffee ? How do climate and physical features favour the production of each of these commodities ? (C.J.)

22. Point out the distribution of forests, grasslands and deserts in South America. What articles of commerce are obtained respectively from these regions ? Which of these regions attracts most settlers ? Give reasons. (C.S.C.)

23. Which do you consider to be the three most important Republics of South America ? Describe carefully the chief geographical advantages possessed by each of the three you select. (L.M.)

24. State the position and importance of : Buenos Aires, Rio de Janeiro, Santiago, Pernambuco, Quito, Iquique. (L.J.)

25. Describe the positions and character of the Llanos, the Selvas, the Pampas, the Falkland Islands, and Lake Titicaca. (C.S.)

26. Under what climatic conditions is each of the following products found ? Name one district or town associated with each :—cacao (the source of cocoa), rubber, guano, nitrate. (C.P.)

27. Write an account of the Amazon basin as regards climate, productions and commerce. (L.J.)

28. Show by a diagram how variation in altitude influences the climate and products of tropical South America, and explain the terms *tierra caliente, tierra templada, tierra fria, paramos*. (C.P.)

29. In what season of the year does rain fall in the different parts of South America ? Account as fully as you can for any facts that you mention. (L.M.)

30. State the position of three of the following, and in each case point out the circumstances which have led to the growth of the town : Valparaiso, Para, Monte Video, Georgetown, Lima, Guayaquil. (L.J.)

31. In what parts of South America and under what conditions are the following produced : cane sugar, cocoa, coffee, quinine ? (L.J.)

32. In what parts of South America have railways been constructed? Give some account of their importance. (L.J.)

33. Give an account of (*a*) the position and extent, (*b*) the physical features, (*c*) the natural products, of Argentina. (C.S.)

34. Write a short account of the Andes:
(*a*) In relation to the drainage of South America.
(*b*) With regard to minerals. (L.J.)

35. Write a short account of the geography of Bolivia, with special reference to its chief products. (C.P.)

36. Describe the development of the Argentine as regards agriculture and railways. (L.J.)

37. Contrast the Selvas and the Pampas as regards position, climate, productions. (L.J.)

GENERAL.

1. On an outline map of North America, insert, with names, the following:
(*a*) The latitude and longitude of New York;
(*b*) The chief river system draining to the Gulf of Mexico;
(*c*) Lake Michigan, Vancouver Island, Florida Peninsula, California, Nova Scotia, Montreal, St. Louis, Chicago. (C.P.)

2. Describe the positions of (*a*) the Bahamas, (*b*) the Bermudas. Compare their climates, describe the occupations of their inhabitants, and mention any other points of interest in connection with one group. (O.J.)

3. Say what you know of that part of North America which lies west of the Rocky Mountains, with special reference to drainage areas, mineral resources and forest productions. (C.S.C.)

4. Mention three important districts in North America for coal-mining. In each case point out the uses to which the coal is put, and state any industries which are carried on in or near the coal areas. (L.J.)

5. (i) Which districts in North America suffer from a deficiency of rainfall? Indicate their position and account for the smallness of the rainfall of each. (ii) Name the most important vegetable productions which are exported from North America and state in what part each is grown in large quantities. (C.J.)

6. What is meant by the Great Valley of California? Why is it important? What part of South America has a climate closely resembling that of California? How do you account for this similarity? Are there any other resemblances that follow from the climatic likeness? (L.M.)

7. Give a short account of the following: The Bahamas, Barbados, Great Salt Lake, Popocatapetl, Yellowstone Park. (C.S.)

8. Describe the coast-line of North America from Nova Scotia to the mouth of the Mississippi as regards physical features and commercial importance.
Compare Halifax and New Orleans with special reference to position, trade, communication. (C.S.C)

9. Mention five of the chief minerals (*other than coal*) which are found in North America. Name for each mineral one district in which it is to be found in large quantities, and indicate the position of each district as exactly as you can, mentioning one town in each which owes its importance to the mineral. (C.J.)

10. Draw a rough sketch map to show the relative positions of: Chicago, Fort William, Buffalo, Montreal and New York.
State briefly (*a*) the advantages and disadvantages of Montreal and New York as centres for trade; (*b*) the commercial importance of Chicago, Fort William and Buffalo. (C.S.C.)

11. In what districts of North America is wheat grown most extensively? Under what conditions does it grow and by what routes is it exported? (L.J.)

12. Account for the fact that—
(*a*) Fogs are frequently to be met with off the coast of Newfoundland.
(*b*) Halifax is a winter port for Canada.
(*c*) Many of the openings in the coast south of New York do not make good harbours. (C.P.)

13. Name and state carefully the position of two very densely populated districts and two very scantily populated districts of the continent of North America. In each case explain as fully as you can why the district is so densely or scantily populated. (C.J.)

14. Name three railways which cross the Rocky Mountains. Describe the route of one of these railways, and point out its commercial importance. (L.J.)

15. Describe the position of two of the following islands: Newfoundland, Vancouver, Cuba.
In each of the two selected cases give some account of the climate, and show that the habits and occupation of the inhabitants have been influenced to some extent by their surroundings. (L.J.)

16. How is it that—
(*a*) Many of the States in the west of the United States require irrigation?
(*b*) The climate of California differs from that of Nova Scotia?
(*c*) The Gulf States grow cotton and sugar?
(*d*) Mexico City, and not Vera Cruz, is the capital of Mexico? (C.P.)

17. Give some account of the districts in North America (*a*) where wheat is grown, (*b*) where gold is found. (C.S.)

18. Describe the Cordilleran system of North America so as to account for its influence on (*a*) climate and (*b*) communications. (C.P.)

19. Describe the Cordilleran or Pacific mountain system of North America and also the general character of the rivers of the Pacific slope. Why is the Pacific coast north of the Columbia river so different in character from the coast to the south of it? (C.S.)

20. In what parts of North America are the following ores obtained: gold, iron and copper?
At what places are the metals separated from the ores, and to what uses are the metals put? (L.J.)

21. Describe the position of the industrial areas of North America (east of the Rocky Mountains) devoted to lumber, fur, cotton and wheat. Explain why each district is specially suited to its particular industry.
Of what advantage is the heavy snowfall in North America to the lumber and wheat-growing industries? (C.S.C.)

22. Describe the desert regions of America, and account for their positions. Name any articles of commerce that are obtained from them. (C.S.)

23. When North America was discovered, some parts were found to consist of dense forests, some of grass lands, and other of deserts. What part belonged to each class, and what is the present character of the vegetation where the same land is cultivated? (C.P.)

24. Describe and account for the seasonal distribution of rainfall in North America. (L.M.)

25. What railway routes connect towns on the Atlantic coast of North America with those on the Pacific coast? Describe a journey by one of them.
How is it that communication by sea between these coasts is so restricted? (L.J.)

26. "The cities of North America have all grown up within the last four hundred years."
Point out the circumstances which led: (*a*) to the establishment of towns in particular places, (*b*) to the rapid growth of towns in recent times.
Account for the development of New York, Chicago, Winnipeg, Montreal, Washington. (C.S.C.)

27. Describe and account for the characteristics of (*a*) the Tundra region, (*b*) the Western Temperate region, (*c*) the Great Basin. (C.S.)

28. Contrast the lands near the mouth of the Mississippi with those on the shores of Hudson Bay as regards climate and vegetation. (L.J.)

29. What are any *four* (not more) of the following?—Peru, Montreal, Ohio, Buenos Aires, Parana, Panama. Indicate where exactly is each you choose, and why it is famous. (C.P.)

30. Compare the habits and occupations of the people who live in a Canadian forest region with those of the dwellers in a Brazilian forest. What articles of commerce are obtained from these regions, and to what markets are they sent? (C S.C.)

31. Describe fully the positions of the towns Halifax (N.S.), Buffalo, and Augusta (Ga.), and explain the geographical reasons of their prosperity. (O.J.)

32. Mention the chief exports of (*a*) Brazil, (*b*) Chile, (*c*) Costa Rica; and state from what parts of Central or South America we get (*a*) silver, (*b*) mahogany, (*c*) quinine. (C.J.)

33. Compare the lower Mississippi valley with the estuary of the St. Lawrence. Say what you know of the inhabitants of these regions. What industries are carried on by them? (C.S.C.)

34. Describe shortly the physical features, climate, productions, and manufactures of either New Brunswick or Virginia. (C.P.)

35. Explain the importance of the following towns with respect to position, exports, imports, and manufactures: Baltimore, Boston, Halifax, Philadelphia, Toronto. (C.P.)

36. Compare and contrast the Mississippi and the St. Lawrence as "useful" rivers. (C.P.)

37. Describe the conditions under which the following live: (*a*) A Canadian wheat-grower, (*b*) an Argentine sheep-farmer. Point out the advantages which Canada offers for wheat-growing and the Argentine for sheep-rearing. Which of these occupations would you prefer? Give reasons. (C.S.C.)

38. Describe what you would see if you travelled by boat up the Mississippi from New Orleans to St. Paul. In what respects would this journey differ from one up the Amazon? (C.S.C.)

39. Compare, and contrast, North and South America in (*a*) structure, and (*b*) climate. (C.P.)

40. By what territories are the following bounded: (*a*) British Columbia, (*b*) British Guiana?

In the case of each of these colonies mention the chief town and one important production. (C.S.C.)

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